
"On Tour"

On Tour

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In This Issue

T. D. Collett ..... *Editor*
R. C. Hagen ..... *Asst. Editor*

ON TOUR is published monthly by Union Oil Company of California for the purpose of keeping Union Oil people informed regarding their company's plans and operations. Reader participation is invited. Address communications to ON TOUR, 617 West 7th Street, Los Angeles 14, California.

The Cover

In the Cascade Mountains of Washington, where Company transports have had a difficult time maintaining delivery schedules, snow exceeding twenty-five feet in depth has threatened even the trees with inundation. This photo by Bob and Ira Spring of Seattle is evidence of a severe winter.

Speculation

IF an employee, upon coming to work for the Company when 25 years of age, were to buy one share of Union Oil common stock each month until he retired at the age of 65—

THEN, based on today's market value and the current rate of dividend payments on these shares—

HE would own at retirement age 480 shares of stock with a cash value of approximately $14,000. His stock earnings in the form of dividends would increase each month until, by the end of his fortieth year of service, he would be receiving dividends of about $1,200 annually.

MOREOVER, if this form of thrift were practised diligently by even a majority of Company employees—

WITHIN 40 years Union Oil Company would enjoy substantial employee-ownership. Besides their wages, employees would receive a large part of the Company's distributed earnings in the form of dividends. They would have an important voice in selecting the Board of Directors, which in turn elects the officers and appoints its executive committee. They would have an owner's interest in achieving maximum production, economical and efficient operation, and an enduring public acceptance of their products and services. It would be difficult to conceive of industry-paralyzing labor disputes, since the employee-owner would have a most powerful incentive for keeping industry in motion. Most probably employee skills, enthusiasm, happiness and security would find few equals anywhere.

OF COURSE no such general result is expected. Indeed, thrift appears to be going through a popularity setback. Too many people are spending all they earn and borrowing to obtain luxuries they can't offord. Governments are following the same trend on a billion-dollar scale.

NEVERTHELESS, opportunity is open to the individual who would master his own destiny. Frugality is one of the best cures for America's ills, and particularly if every workman would help to furnish his own tools.

ATTENTION EMPLOYEE SHAREHOLDERS!

The Annual Shareholders' Meeting is scheduled for April 12th. If you do not plan to attend this meeting personally, please sign and return the proxy that has been mailed to you. No employee should regard his or her holdings as being too small for representation at this meeting.

The proprietor of this Snoqualmie Pass inn regards snow clearance from his parking area as one of the season's greatest achievements.

THE BIG SNOW

By Gudrun M. Larsen

THE winter just ending will linger in western memories well beyond the melting of our unprecedented snows. And, together with pilots of "Operation Haylift," snowbound ranchers and marooned travelers, those who remember longest will be our transport drivers who handle the petroleum run from Seattle and Edmonds to customers east of the Cascade Mountains.

Snow is a formidable opponent every winter on the run over Snoqualmie Pass to Ellensburg and on to Yakima, Prosser, Sunnyside and Toppenish. Ice, deep drifts and snow slides are annually taken in stride. But 1949 has produced the severest test in at least twenty-five years, according to veterans who operated that long ago.

For instance, on February 8th snow to an official depth of sixteen feet was measured on the Pass. But storm

Along some sections of the Pass snowplows have worked twenty-four hours a day to keep one lane of highway open to winter traffic.

In the darkness at 3 a.m. driver Joseph Larama assists in loading his truck-and-trailer unit at Edmonds prior to facing the Cascades.

Mountaineering transports in Washington are equipped with sanders for supplying traction in case of emergency stops on icy roads.

after storm kept it fluttering down one and two feet at a time until on February 17th snow depths exceeded twenty-three feet. As if that wasn't enough, the weatherman had nothing to report except more of the same.

Not even our most staid drivers of Viking descent could deny that Old Man Winter still packs a lethal punch. He was forcing the use of skid-chains over every foot of highway. He was closing portions of the road every few hours and all but out-slugging a fleet of snowplows. For several days during February he held 300 trucks at Ellensburg, refusing to let them in or out. Exhausted State Highway workers have several times been inclined to toss in the towel, hoping for a return bout in the spring.

Twelve months every year, six days every week, twenty-four hours every day our big, red "76" transports are scheduled to hit the Cascades trail. First truck of the week leaves Edmonds in 3 o'clock darkness each Monday morning for the 107-mile jaunt to Ellensburg. In good weather this run is completed in about five hours. At this writing it is conquered when and if the big snow permits, often requiring up to ten hours and longer.

Our "Semis" on the job weigh about 68,000 pounds when loaded with 6,100 gallons of gasoline. Truck-and-trailer units carry 6,300 gallons and weigh around 72,000 pounds. Even in dry weather such weights represent a heavy pull over winding mountain roads. But with several inches of snow blocking the wheels, or a blizzard icing the windshield, or glare ice turning the highway into a third-class skating rink, truck-driving begins to rival ski-jumping for excitement. Sure you have some eighteen or twenty big truck tires constantly groping through snow to grasp bare pavement. Yet quite often you get the spine-tingling sensation that all

Signing for a 6000-gallon load of gasoline is the driver's farewell gesture before buckling down to a long fight against snow.

At this point in the journey, a Highway Department sign compels all vehicles to put on chains for the grades and blizzards ahead.

eighteen or twenty have groped in vain. Fancy getting a passing motorist to help you push 68,000 pounds of truck and gasoline out of a roadside ditch!

The route from Edmonds begins to get toughest on a four-mile stretch of seven-per-cent grade approaching the summit. There a top speed of ten miles per hour gives you plenty of time to wonder about conditions on Airplane Flats.

Airplane Flats is the location of a treacherous no-man's-land about one-half block long. Above, great acreages of snow frequently slip off the mountainside, gather up all the trees and loose rocks in their path, and fall enmasse on the highway.

Usually our men find a one-way traffic lane through the danger zone. Occasionally they face a towering barricade of hard-packed snow and debris, which can force a wait of many hours for the snowplows. On one occasion a year ago our truck and a snowslide arrived at Airplane Flats simultaneously. After an uncomfortable delay, the driver was rescued and the truck was dug clear. Drivers have had better luck this year, but no experienced man stops there to survey the landscape.

Regardless of the weather, however, folks over the mountains have to keep their cars running, their shops and machines operating, their homes warmed. It was for such services that the petroleum industry was conceived.

Sometimes, during a long siege of big snow surpremacy, storage tanks get critically low and a huge backlog of orders piles up on our supply side of the Cascades. After one such wintry roadblock, the storms took a two-day breather. Between Saturday morning and Sunday night we slipped fifty-two loads of oil over Snoqualmie Pass to give cheering customers their best supply status of the season.

A cafe oasis enroute is not overlooked by driver Frank Ward, right, and two Inland Petroleum drivers who are hauling Union products.

At Ellensburg Frank Ward signs truck and cargo over to Bruce Kidd, right, who will continue on as far as Yakima and return.

Cars and trucks proceed single file through a Snoqualmie Pass danger spot that has been repeatedly blocked by unprecedented snows.

At Leased Service Station No. 1109, Ellensburg, the relieved operator and driver find storage tanks critically low but not empty.

"The Greeks Had a Word For It"

By Reese H. Taylor, President
Union Oil Company of California
At the Annual Banquet of the
Petroleum Division of AIM&ME

San Francisco, California
February 15, 1949

IT is a real pleasure to be with you this evening. It is also a rather unique occasion. For I got to thinking on the way up here from Los Angeles that, while I've talked to a lot of groups in my lifetime, this is the first group I ever talked to whose *profession* is younger than I am.

I was born in 1900. And in 1900, if I'm not mistaken, the petroleum engineer and the petroleum geologist as we know them today simply didn't exist. At Union Oil we hired our first full-fledged petroleum engineer in 1919. And our geological department—the first one established, I believe, by any oil company on the Pacific Coast—was set up by Bill Orcutt in 1903.

I don't know whether that makes you fellows members of the world's *youngest* professsion or not. Certainly yours is *one* of the world's youngest.

At any rate, this profession of yours—young as it is—has developed at an amazing rate. And I don't think anyone will argue that it hasn't been a great boon to the industry.

But I might also point out that along with this remarkable growth, the field of petroleum geology and petroleum engineering has become remarkably complex and specialized as well. So specialized that—from management's viewpoint at least—I sometimes wonder if you fellows aren't beginning to bear an alarming resemblance to the saber-toothed tiger which became so highly specialized that he could not survive his environment.

Back in the old days when a stout pair of hobnailed boots or a team of bang tails and a bone shaking buckboard took the place of a car or a plane, the oil companies used to employ two or three men who were equally expert in exploration, drilling and production—fellows like Billy Loftus, Tom O'Donnell, and Bill Orcutt. These men would travel around the country looking for places to drill. When they found a likely spot they would lease up the land themselves, make their own locations, direct their own drilling operations, supervise the completion of the wells and even help the pumpers with their production problems.

Now I realize that, by today's standards, this was a poor way to run an oil company. But those old-timers must have been shot with luck. For they managed to bring in Santa Fe Springs, Lakeview, Lost Hills, Orcutt, Brea Olinda, and many other fields by these methods.

Today, of course, we know better. Matters are handled with considerable more science.

If our Vice President in charge of Field Operations manages to persuade our executive committee that we should explore a new area, the operation is carried on something like this: The Vice President outlines the project to our Chief Geologist. The Chief Geologist goes to work and gets a set of aerial photographs made

of the area. Then he hands these photographs over to a specialist in photogrammetry. Let's say the study shows the area to be a deep sedimentary basin with several interesting structural features. The Chief Geologist then sends one of his field geologists into the area to map the structures.

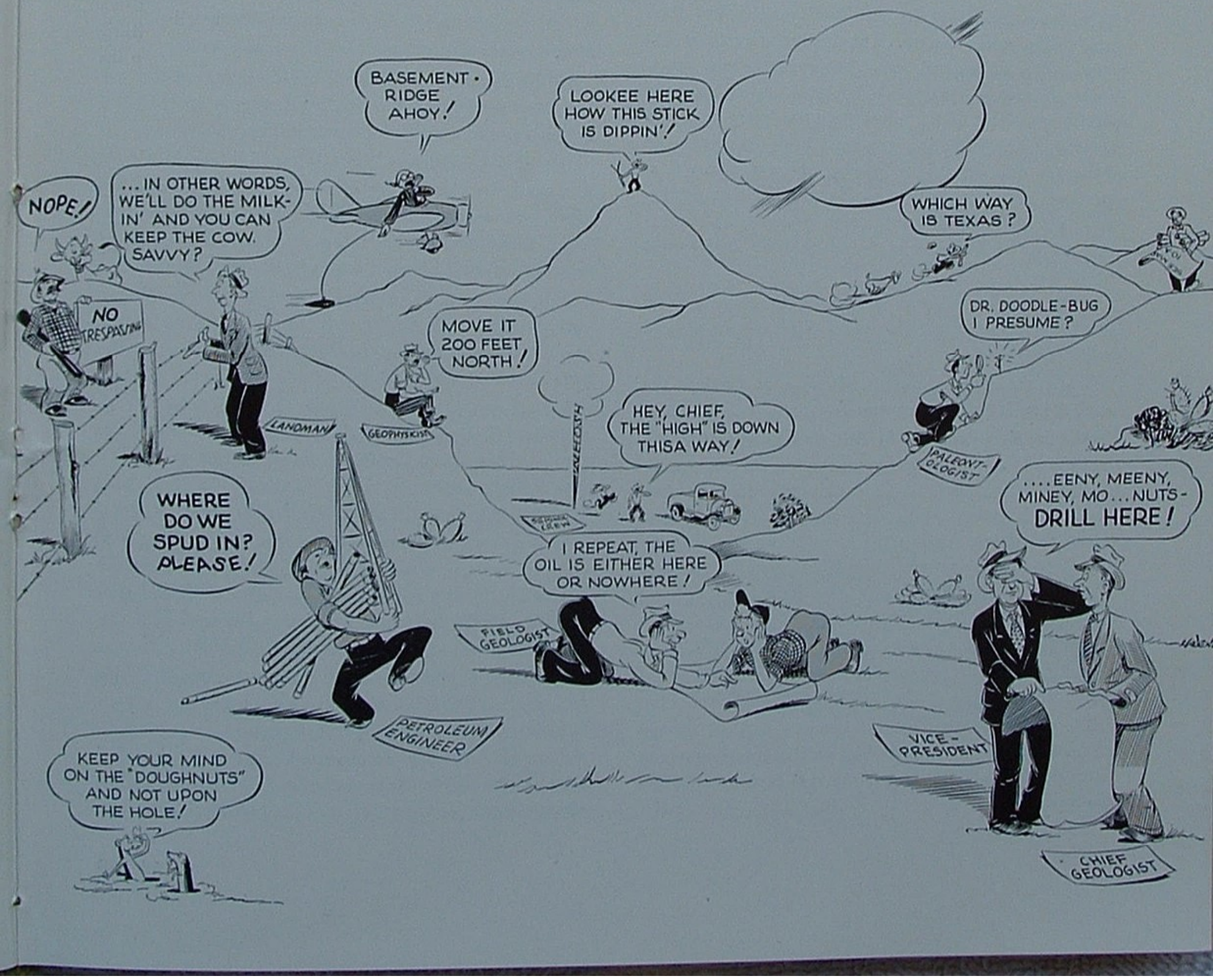
The field geologist finally turns in a report which consists of 70 type-written pages and 22 maps and sections of the structural features mapped on various horizons.

The report shows that some of the structures have too much closure, others have too little; some are noses and lack closures entirely; some are badly faulted and still others are overlain by thick sections of continental beds. It ends with a recommendation that a detailed study of the area be made by a micropaleontologist.

So the micropaleontologist goes out and takes samples from outcrops and core holes. He draws up a paleogeographic map to show the extent of ancient seas that invaded the area and studies hundreds of samples. After that he turns in a five pound report which lists each foram by name and contains several pages of symbols that even the Chief Geologist can't understand.

With the help of a few translators and interpreters, however, the Geological Department decides that the paleontology report indicates that facies changes are present. This suggests that the formations under the structures mapped by the field geologist may be too tight to contain oil. The best areas may be in the flatter country between these structures. Consequently, on the recommendation of the micropaleontologist they decide that the area should be further explored by geophysical methods.

The flying magnetometer is employed over the area and the results suggest the presence of a basement ridge. Consequently the magnetometer expert recommends that this area be further checked with a gravity meter to determine the extent and shape of the ridge.



The specialist in gravity interpretation submits a map contoured on equal density which shows an anomaly that he suggests indicates the presence of a basement ridge. Then two days later he submits a second map of the same area which is based on the second dirivative and suggests that the ridge is not present at all. After dropping this bombshell he recommends that the area be shot by reflection seismograph.

The reflection seismograph party moves into the area and shoots a number of profiles. They submit maps and cross-sections which indicate that the area where the basement ridge is supposed to be is actually *low*. Furthermore, some of the structures previously mapped are complicated by faulting which occurs at depth but is not recognizable at the surface. They recommend that further work be done in the area.

At this point the Chief Geologist looks over all the reports again and finally decides that the first structure mapped might be just as good as any of the others. So he refers the subject to the Land Department for leasing.

The lease man contacts the land owner. The land owner calls in his lawyer. The lawyer requests a tax expert. The tax expert, anticipating inheritance taxes, decides he needs a valuation engineer to estimate the amount and value of the oil and gas that may be under the land. The valuation engineer finds he needs an expert gas man to aid in figuring the gas reserves, a petroleum engineer to help in figuring reservoir pressures, and an expert in unitization procedure to determine the percentage likely to be realized under unit operation.

A title man is called in to pass on the title, and an expert on rights-of-way to interpret some obscure clauses regarding trespass.

Finally the lease is completed and sent through the usual channels to be documented.

Then the Vice President in charge of Field Operations comes back to our executive commitee for an appropriation to drill. By this time, naturally, the executive committee is several years older and has forgotten most of the details of the deal. But after wading through several pounds of reports they appropriate the money.

The Vice President in charge of Field Operations calls in the Chief Geologist and tells him to make the location. The Chief Geologist calls a consultation of his various specialists and they spread out their maps and begin to discuss the location of the well.

The field geologist, naturally, wants to drill on top of the structure he mapped. The paleontologist wants to move the location 100 feet to the east because of facies changes.

The geophysicist wants to move it 200 feet north because of velocity gradients.

The land man thinks it should be 100 feet south because of the offset clause in the lease.

The lawyer drops in and thinks it ought to be moved further west to insure a more suitable position for unitization.

At this point the Vice President happens to come by, takes a look, stabs his finger at the map and says, "Nuts —let's drill here."

So the surveyor is called in and told to drive a stake at the chosen location.

A few days later, the Manager of Operations, Drilling Superintendent, Division Petroleum Engineer, Drilling Contract Supervisor and Mud Engineer drive out to the location to make the necessary lay-out on the ground.

Things proceed with just about the normal amount of confusion for a day or two and then the Lease Supervisor suddenly reminds everyone that the lease carries an obligation to spud within one week.

This throws the whole department into a tailspin but after a week of overtime the well is spudded.

In the meantime the Petroleum Engineer on the job has been setting up his drilling program including a design for the casing to be run in the well.

But when he delivers it neatly typed, blueprinted and packaged, the Purchasing Agent informs him that those pipe sizes are unavailable. So the design is thrown out and the tool pusher figures out how to run the various sizes and grades of pipe that are available.

The geologists have also been busy formulating a coring program. But when they turn this in, the Manager of Operations trims the daylights out of it because the costs involved are too high.

Consequently, as the well goes down, the cores which are taken don't give enough information to satisfy the core analysis expert, so he recommends that an electric log analysis expert is called in and for a short time everyone seems relatively satisfied with the operations.

This doesn't last long, however, because the next core analysis convinces the core analysis expert that the wrong kind of drilling mud is being used and that possible productive sands are being damaged. He recommends that the Mud Engineer be called in again.

The Mud Engineer fusses around with a pinch of this and a shovelful of that until he's worked out a new formula and they start drilling again.

Next time they run an electric log, however, they find that the new mud is not conductive to procuring normal electric logs. Furthermore, the sand analysis indicates

that the well should be productive, but the electric log indicates the contrary.

Everything is halted once more and a gamma ray log is run. This fails to settle the argument, so they run a neutron log. The neutron log specialist's only contribution is to question the wisdom of ever drilling the well in the first place.

So after the roomful of specialists have argued back and forth for two or three days, someone makes the brilliant suggestion that they drill the well deeper. When this decision is passed on down to the tool-pusher, he gives his crew a four letter word lecture on the value of higher education and points out that he made this suggestion several days ago.

Shortly after this a good oil sand is encountered and everyone begins to say "I told you so." But the reserves expert cools them all off by discovering the sand is only two feet thick.

The well is pushed on down and encounters hundreds and hundreds of feet of shale which finally turns to grey sand. Another conference of the experts is held.

The tool pusher says the sand is wet. The electric log is negative. The sand analysis indicates possible gas production.

After listening to everyone's opinions, the Vice President calls his wife. She consults her astrology charts and tells him to run the pipe.

By this time, however, the string isn't long enough to reach the bottom of the hole, so the Purchasing Agent has to get the President to call a friend of his in the steel business to put some pressure on a pipe outfit to get additional pipe.

The research experts inform the engineers that certain specifications regarding the slots for the linear should be followed. But by the time the pipe is procured there's no time for this and the well is gun perforated.

The well won't flow so the production engineer and the mechanical engineer go into another conference to decide what kind of artificial lift devices they ought to use. The process engineers design gas separation equipment, gas lines and gas treating facilities.

When all this is done and the equipment is installed, we find that we've enlisted the help of 35 different specialists on the project to get a well that will produce 35 barrels per day of 35° gravity crude.

Now this may be a slightly exaggerated account of what goes on around a modern oil company. But if I can be serious for a moment, I think there is a moral here that might well merit some serious consideration.

I know as well as you do that we can't operate and develop our modern industrial technologies without specialization. In fact, the farther we develop our technologies the more specialized we've got to become. So there's no going back to the old methods.

However, that's no reason why we have to let this specilization make us completely lopsided as individuals.

The fifth century Greeks, as you probably know, were particularly sensitive to the dangers of specialization. They'd seen its effects on the Spartans. The ideal which they strived for was a well-rounded life. In fact they took this concept so seriously that their word "idiotes," from which our word "idiot" was derived, denoted a private citizen who took no part in public affairs.

Their term for specialization—which has no counterpart in English—was "banausia."* It denoted the state of a person who centrated on one specialty to the point where his development as an all 'round personality suffered. And they held this person in even more contempt than the "idiot" who refused to take a part in public affairs.

Now I don't think it's any prerogative of mine to tell you how you should conduct your private lives. I'm not going to suggest that you should take up water colors or interpretive dancing or second violin in a string quartet.

But I do think you might ask yourself seriously if you are well-rounded in your *business* life.

For one of the commonest pitfalls of specialization is the tendency to become so interested in *techniques* that the *means* become more important than the *ends*—the *methods* more important than the *objectives*.

An extreme and rather humorous example of this is the story they tell about one of the men in charge of drilling for a major oil company here on the coast. A few years back his department had just finished drilling

. . . "A quarter of a million dollars for one blank, blank sea shell!"

* (Pronounced: bah-now-see-a)

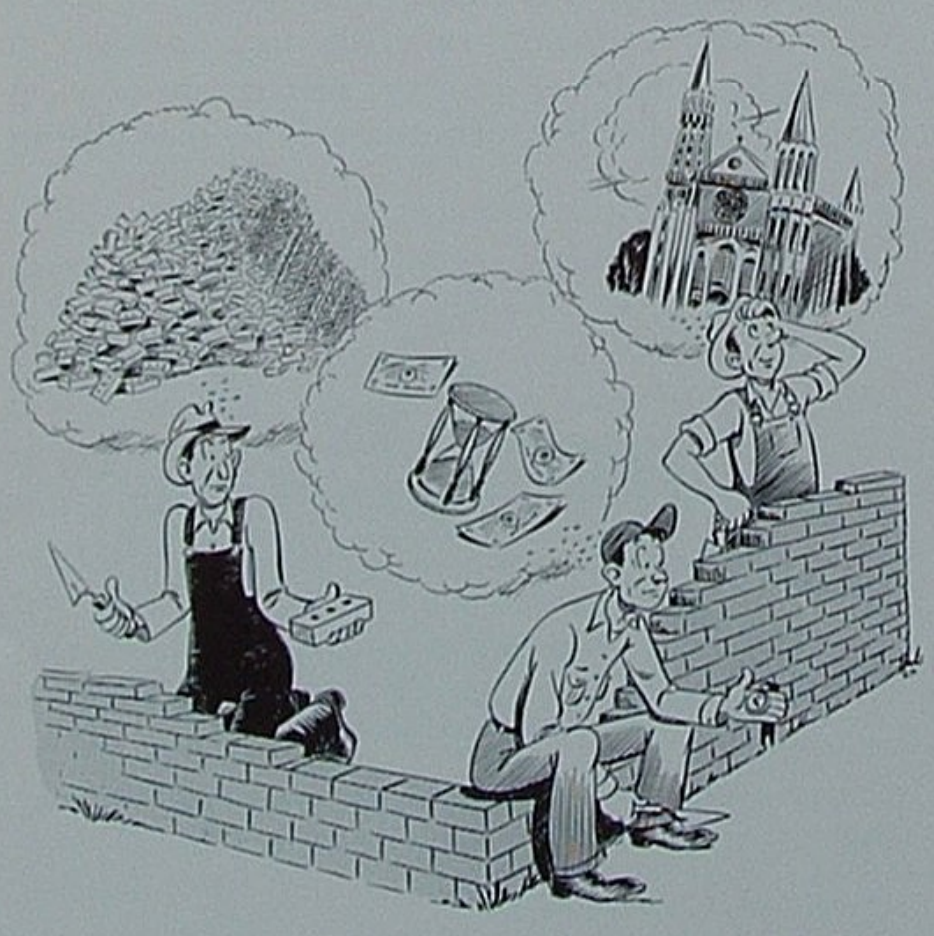
a $250,000 dry hole that proved absolutely nothing. The gentleman in question had had the report on his desk for several days trying to figure out some way to break the news as gently as possible to his management. One of the last items to come in was the final report of the paleontologist which started off something like this:

> "In spite of the fact that the well failed to bring in any oil, it was amply justified because we found a Plectofrondicularia at 10,020 feet. Up until now this particular foramanifera has never been known to occur at this level, etc."

Any of you who know the gentleman in question can imagine his reaction to that . . . "A quarter of a million dollars for one blank, blank sea shell!" This is an extreme example, of course, but it still hits pretty close to home. The point to keep in mind is that specialized skills and knowledge in your fields should be developed as far as possible. But let's not get so engrossed in these techniques that they become the be-all and the end-all.

The real task that we're devoting our talents to is not the classification of forams, the mapping of geological structures or the improvement of secondary recovery techniques. It is not the production and finding of crude oil. In fact, it is not even the creation of gasoline and fuel oil and asphalts and lubricants and all the other petroleum products.

Our real task is providing power and heat and transportation and roads and friction-free machines for *people*. Only when you combine all the hundreds of special talents that go into the creation and distribution of petroleum products, and then translate those products into terms of *what they do for people*, does our work mean anything.



Once we get that perspective, I think we can all perform our particular specialties better. For we'll see our work in relation to the whole—to the overall task that our industry is performing.

That's why I'd like to suggest in closing that you fellows develop a speaking acquaintance, at least, with the other branches of the industry. How many of you really take an interest in the marketing problems of the industry, for example—or its financial affairs?

The only way you can get a true perspective of this task you're devoting your life to—this task of providing power and heat and transportation and so on for *people*—is to have a sound understanding of all the different activities that contribute to it.

Once we have that sound understanding, we'll not only avoid the danger of business "banausia," but I think we'll all get more personal satisfaction out of our specialized tasks as well.

For one of the great challenges that faces our modern, industrial civilization is the problem of helping the individual to see the *significance* of his contribution to society. As our industrial techniques become more and more complex, each person's part becomes more and more specialized. Consequently we run an ever greater risk of making people feel like cogs in a great, impersonal machine.

This is a direct contradiction to the fundamental philosophy on which our whole American way of life is based. For our free government, our free economy and all our freedoms are completely rooted in the Christian concept of the *importance of the individual*. And the more specialized and narrow we become the more apt we are to lose sight of the significance of our contribution as an individual to society as a whole.

Unless we keep constantly aware of this danger we run a very real risk of losing our perspective.

For there is a lot of sound truth in the old parable of the three stone masons who were asked one day what they were doing.

The first said he was laying a stone.

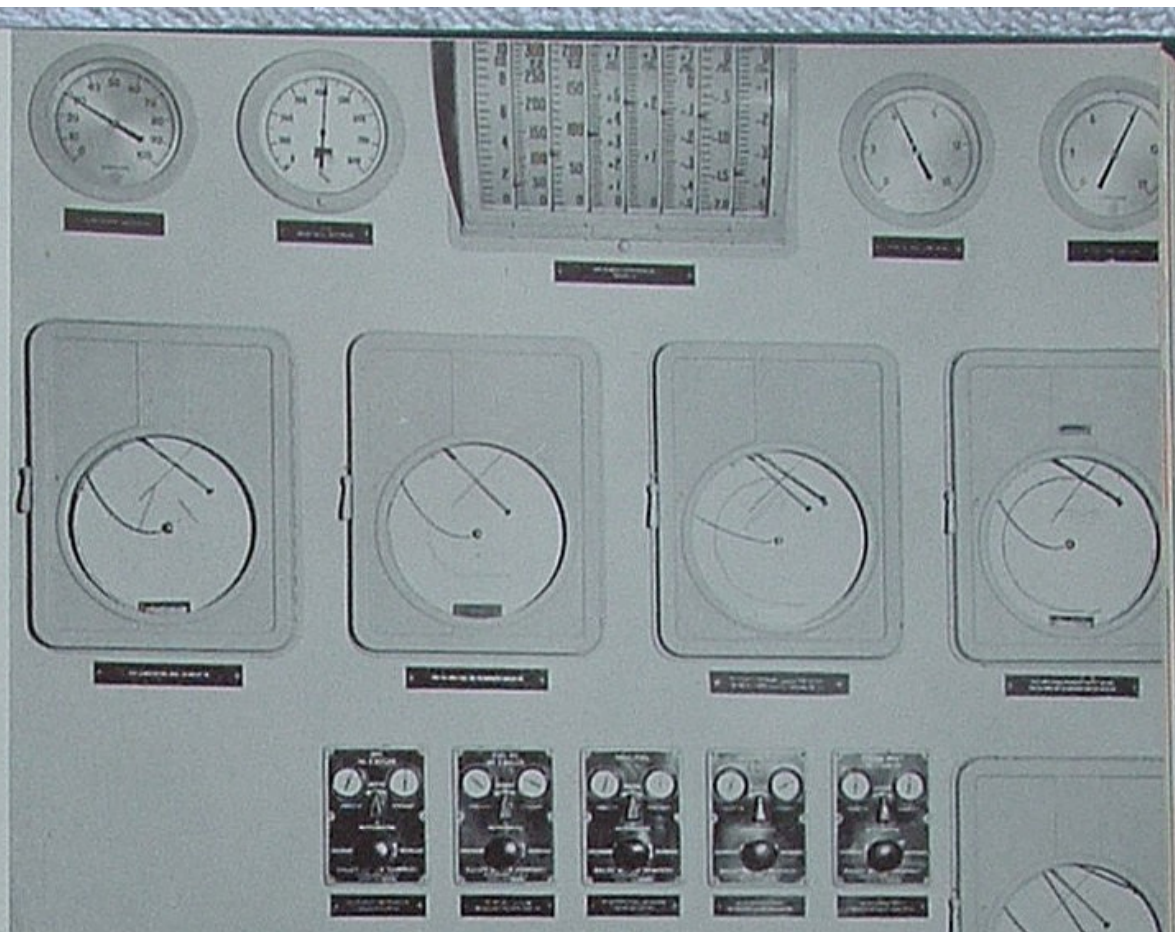
The second said he was earning $3.00 an hour.

But the third said, "I am building a church."

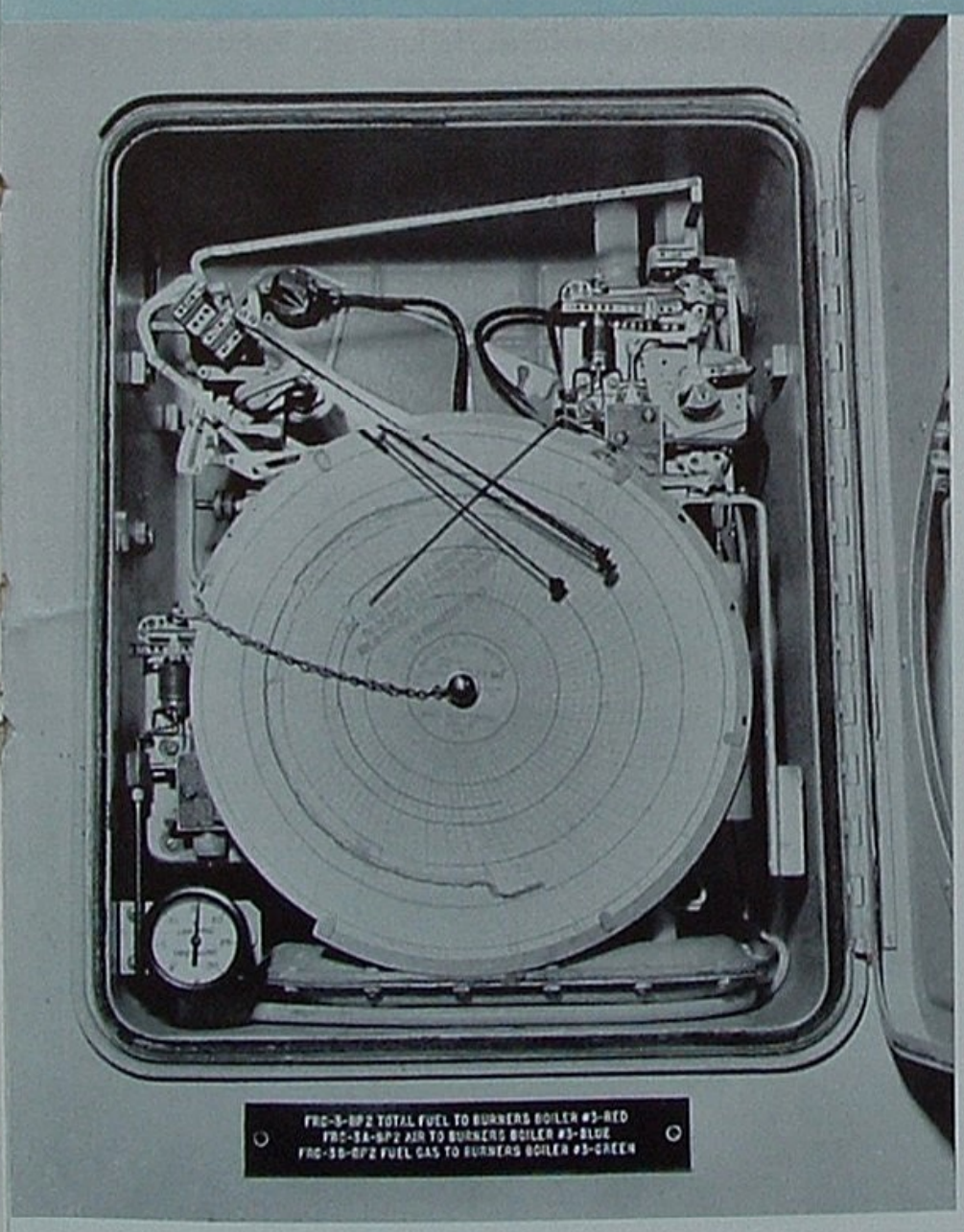
The *people*, whose lives are made easier and happier and more abundant by the products we provide, are a lot more important than the techniques we develop, or the money that we earn.

I thank you.

ON TOUR invites you to this introductory inspection of the Instrument Department at Los Angeles Refinery, acknowledged by many authorities to be the best equipped and best organized department of its kind in the United States.—The Editor.



Instrumentation



By Robert F. Angell

THIS isn't meant to be a discussion of instruments we normally associate with music, surgery, blind flying and their ilk. Our Los Angeles Refinery Instrument Department is concerned only with industrial instruments that keep the refinery running efficiently twenty-four hours a day. The more important of these have been designed for the measurement and control of temperature, pressure, flow and liquid level. But we have certain types that make analyses and record these analyses on a chart continuously; some that record and control the acid content of liquids; others that record gas analysis and specific gravity; and still others that record boiling points and end points of petroleum products.

The casual visitor or new employee is often bewildered by the mass of fine springs, wires, dials and even radio tubes that make up one of these modern industrial robots. Then when he observes the mechanism working, with its uncanny precision for timing and its ability to make minute adjustments in million-dollar processes, he usually regards it as being almost human. Actually, it can do some jobs better than a man. It is tireless and

Here with red, blue and green inks a modern instrument records the fuel and air intake of a boiler.

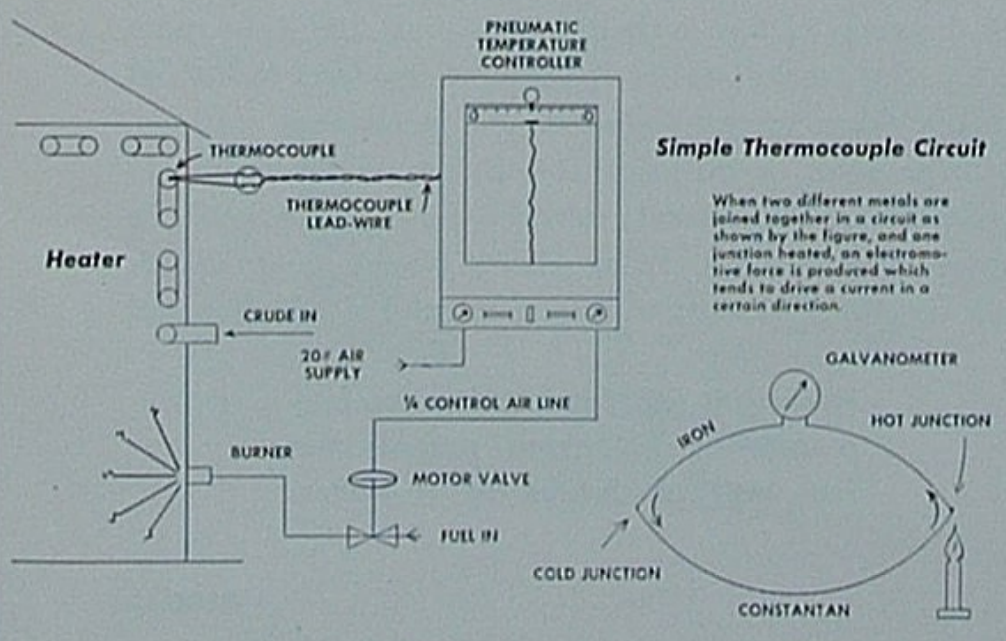
The control room of the Thermofor Catalytic Cracker represents the pulse of this multi-million dollar unit. Instruments govern the entire process under the watchful supervision of a half-dozen operators.

untemperamental. It is quicker, steadier, more accurate, more dependable. It has produced more products at a lower cost. It doesn't stop for refreshments, meals or a night's rest. However, it cannot think; and therein lies the reason why man will remain the master and the instrument his mechanical slave.

The march of refining techniques during the last twenty-five years has been matched step by step by advances in instrumentation. Formerly we were satisfied to measure temperatures of 1000 degrees F. to within 25 or 30 degrees of accuracy; today in certain installations we insist upon accuracies as close as one-half degree. Twenty-five years ago we used instruments as a guide to operation; today we depend upon them to control distillation units, make changes in load or feed stocks, and anticipate trends with greater speed and accuracy than can an operator.

Refinery temperature measurements are usually made by means of a thermocouple, a device consisting basically of two dissimilar metals welded together. When this

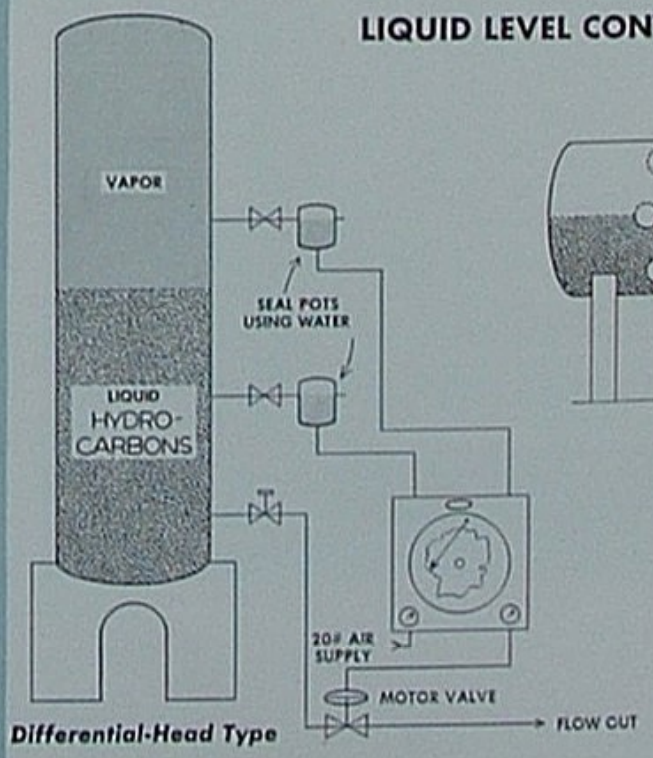
THERMO-ELECTRIC TEMPERATURE CONTROL



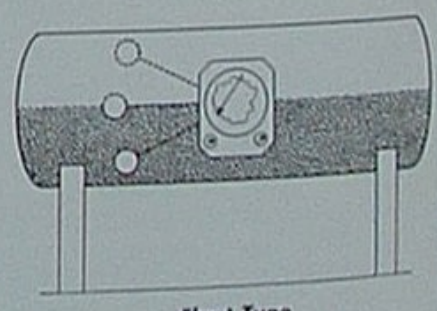
Simple Thermocouple Circuit

When two different metals are joined together in a circuit as shown by the figure, and one junction heated, an electromotive force is produced which tends to drive a current in a certain direction.

LIQUID LEVEL CONTROL



Differential-Head Type



Float Type

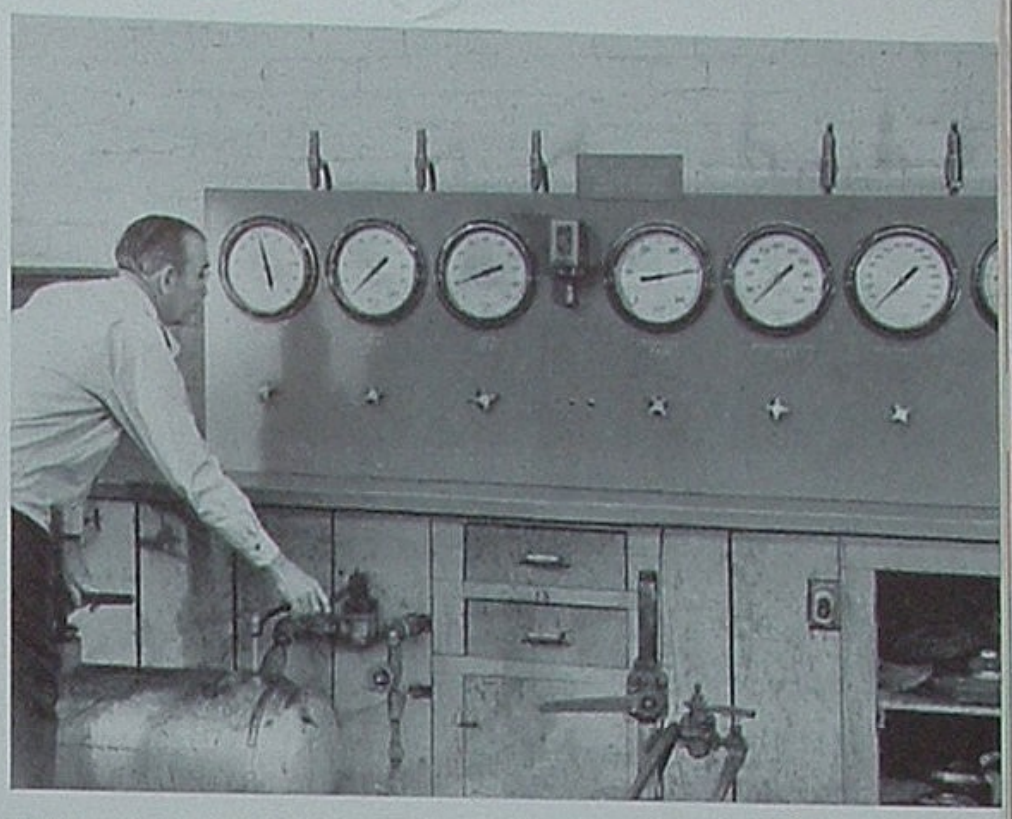
junction of metal comes into contact with heat, a very small quantity of electricity is developed. The electricity is transmitted by wires to indicating or recording apparatus, where it is interpreted in terms of temperature. We have approximately 2400 thermocouples installed at Los Angeles Refinery.

The measurement of pressure is accomplished by means of a curved, hollow metallic tube invented by Eugene Bourdon in 1845. As pressure is increased inside the tube, it tends to straighten out quite like a garden hose reacts to the pressure of water. By linking the free end of the Bourdon tube to an indicating pointer or pen, the exact pressure can be read on a marked dial or traced on a paper chart.

Flow measurements in an oil refinery are made possible through use of a controlled obstruction, or orifice, in a pipe line. The orifice, with a hole somewhat smaller than the pipe's inside diameter, is placed between the flanged ends of two pipe sections and forms a partial obstruction to flow. By measuring the differing pressures on each side of this orifice the flow rate of a line can be computed in barrels per day.

Liquid level instruments consist of floats attached to external indicators or recorders, or of mercury manometers which measure depth by weighing the liquid pressure or "head."

After a measurement of temperature, pressure, flow or liquid level is made, the control portion of an instrument determines automatically whether a change is needed. Practically all control instruments in an oil refinery are air operated, that is, they make operating changes by delivering air pressure to a diaphragm on top of a motor valve. You will see miles and miles of one-quarter-inch copper tubing extending from all sections of a refining unit to a central control house. It is through these tubes that air impulses are transmitted



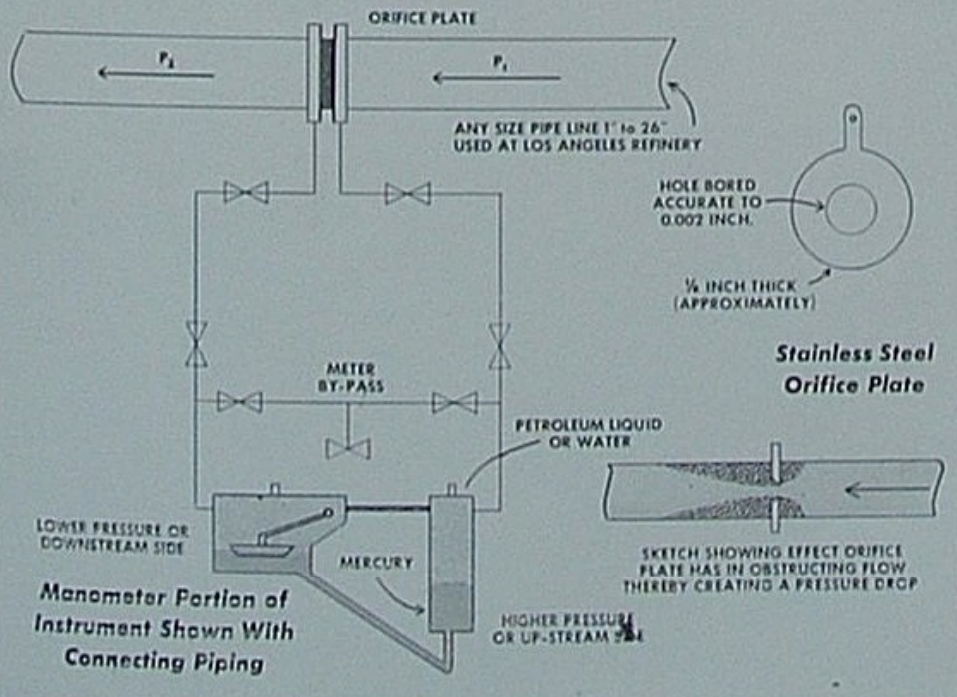
Ed Hendricks, Valve Shop foreman, considers a panel of pressure gauges indispensable for testing valves.

from measuring devices through control house to motor valve.

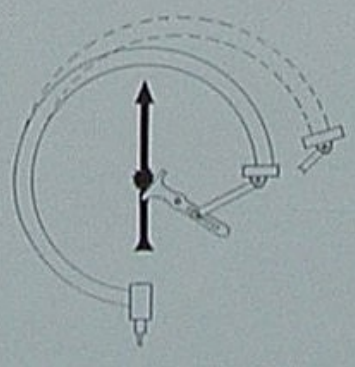
The operator of a large refining unit takes numerous readings from instruments in his control house, watching them for trends and control points. All control instruments have convenient knobs and pointers by which the operator can specify desired rates and results. However, some controls have eliminated even the setting of an index pointer and are entirely automatic. Instead of requiring an operator to move the index pointer, an allied instrument is installed that makes the proper decision and attends to all details.

One of the less complicated of such coordinated mechanical controls is installed in the boiler plant where steam is generated for Alkylation Unit No. 110. Here

ORIFICE TYPE FLOW METER



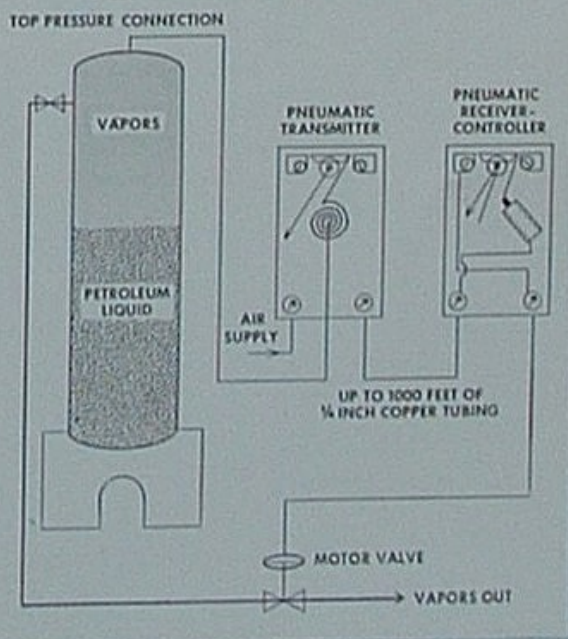
PRINCIPLES OF PRESSURE MEASUREMENT



Simplest Bourdon Tube

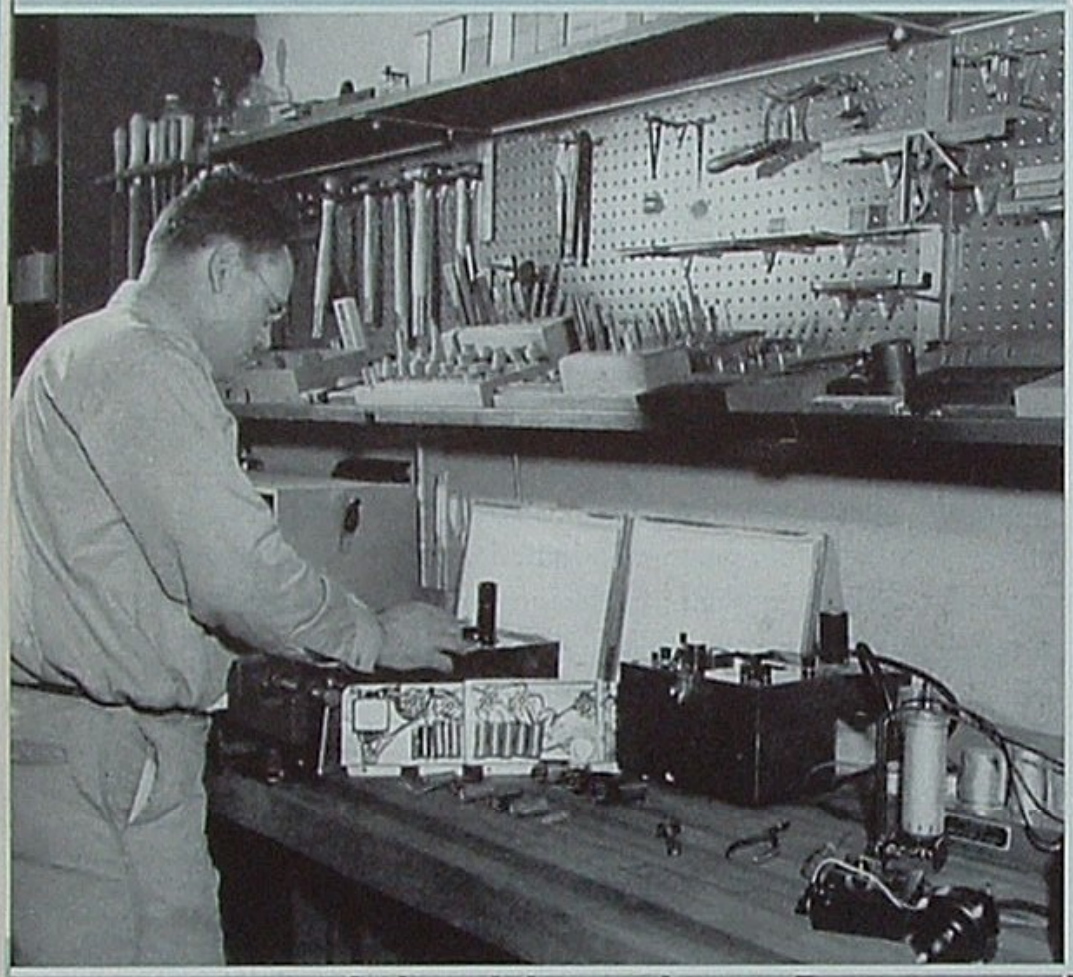
INVENTED 1845 BY EUGENE BOURDON
PATENTED IN U. S. A., 1852
STILL IN USE TODAY

Simple Pneumatic Pressure Control System



Right: Much credit for an excellent department and full credit for this informative article goes to Foreman Bob Angell, here explaining storage of parts.

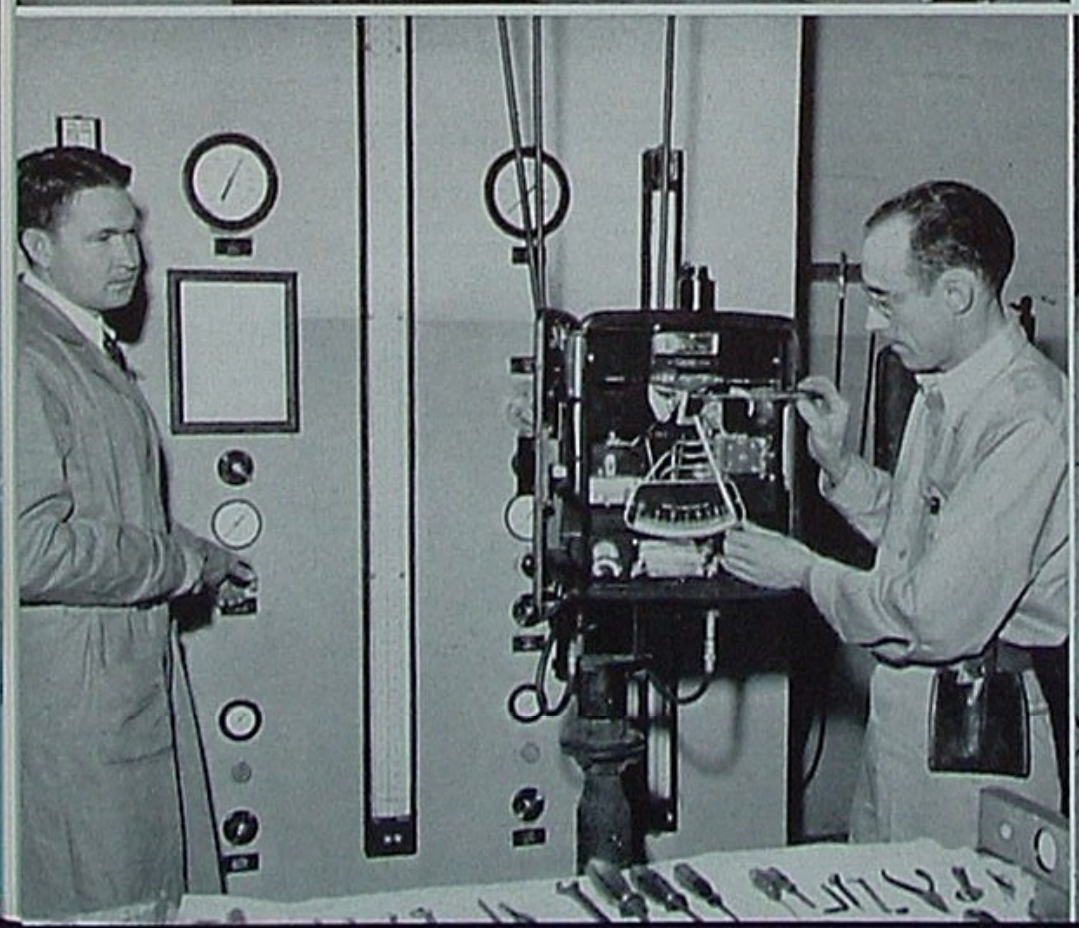
Below: More than twenty-five years of refinery experience and study are behind Vic Jones' mastery of such equipment as this electronic drive amplifier he repairs.



Below, left to right:

"Sometimes it takes an instrument to catch an instrument," paraphrased Jack Thornsberry, right, as he and Bob Tobi checked a flow-control mechanism for Unit 33.

Instrument Man Ted Becker adjusts a liquid level controller for Foreman Lee Amlinger. When pointer at left moves to "60," liquid flow to TCC rerun column stops.



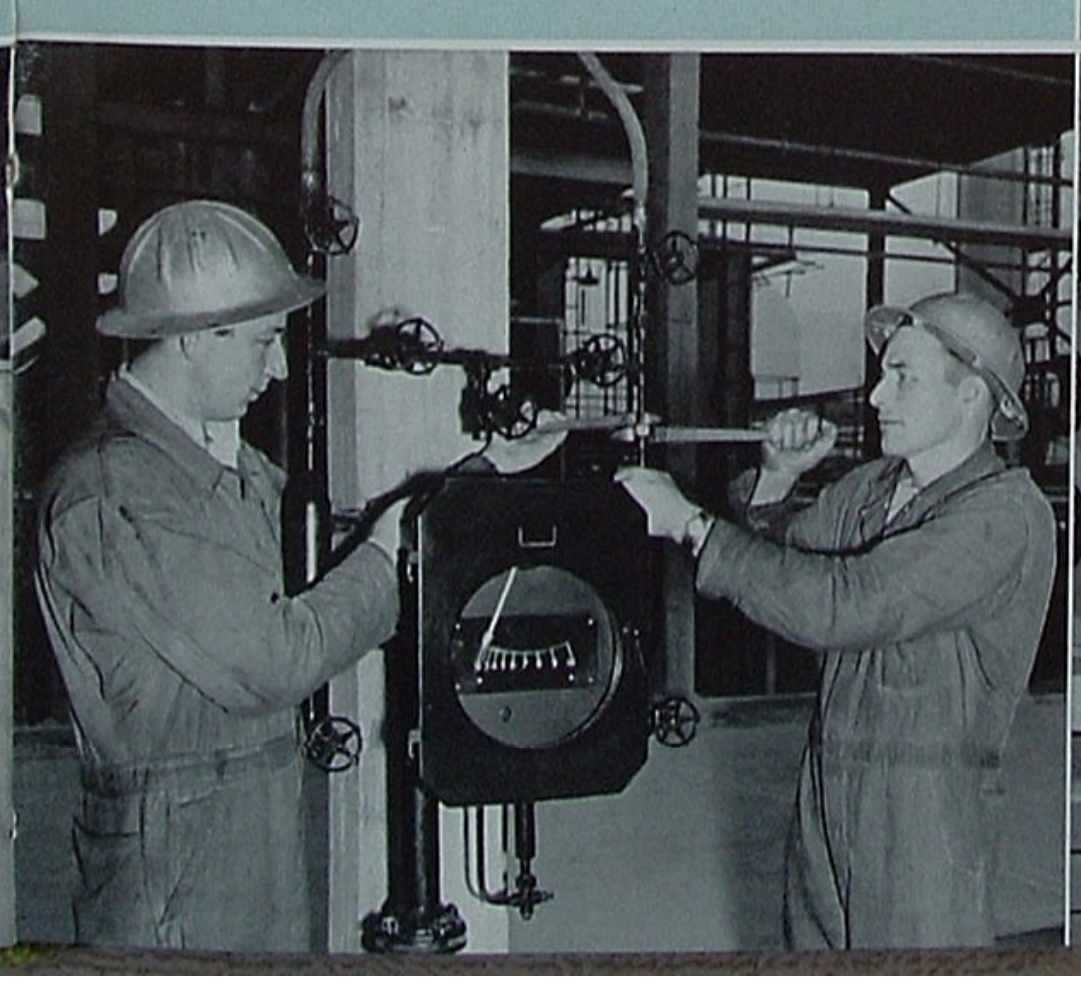
Left: At a test bench Ed Geach uses a potentiometer to check the calibration of an electronic controller used to regulate temperatures of towers or firing of heaters.

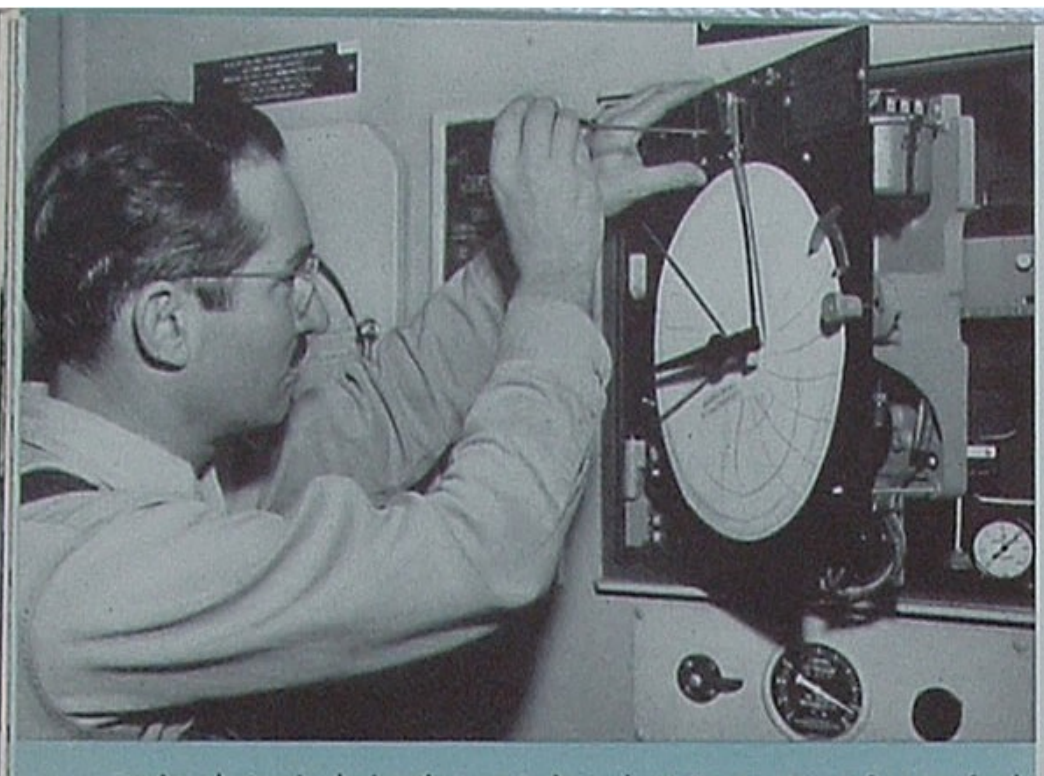
Below: The modern, well-equipped Instrument Shop at Los Angeles Refinery and a highly competent staff reflect over twenty-five years of technical planning.

Below, left to right:

Completing the refinery installation of an indicating flow meter, which measures water circulation to caustic wash drum, are D. Davis, left, and D. B. Hays.

One of 300 indicating pressure gauges in use at the refinery comes to Joe Kovaly for diagnosis. These mechanisms were invented by Eugene Bourdon in 1845.





An electronic device that controls preheat temperature of rerun feed gasoline receives preventive maintenance service from Harold Penhale.

Ralph Apel, left, and Foreman Robert Cakebread use portable test equipment to determine the pH (acidity-alkalinity) content of sample.

a master control handles three panels of instruments that, in turn, control three boilers. Although only a ten-minutes supply of water is kept in each of the boilers, they never run dry. They can burn either gas or fuel oil and can change from one fuel to the other without human aid or intervention. They maintain a steady 400-pound head of steam. In addition, the instruments do their own measuring and recording of feed water to each boiler, fuel oil to burners, gas to burners, air to burners, and keep books on the amount of steam produced.

THE DEPARTMENT

The Instrument Department at Los Angeles Refinery was started approximately thirty years ago, prior to which time all adjustments and repairs were made by any handy employee available. Today twenty-five well trained men are employed in this one department, due principally to great expansion in the use of mechanical controls.

The Department has three direct functions: We give assistance to other departments in making a proper selection of instruments. Then, when this type of equipment is selected, it is our responsibility to install it. Finally we must keep all instruments working at close to 100 per cent commercial accuracy. Further, because of our special training in the precision equipment field, we are often called upon to adjust and repair miscellaneous apparatus of a related nature used in the Company's hospital, laboratories and so on.

Many pieces of mechanical equipment, including the automobile you drive, can operate below top efficiency and still perform to a satisfactory degree. On the other hand, an electric light bulb either lights or it doesn't light, and a doorbell either rings or it doesn't ring.

At a Monday evening study session, Ed Adcock, center, passes his knowledge of instruments and advancements to newer personnel.

Elaborate mountings, cut-aways, drawings and other visual aids are prepared to show every apprentice how modern instruments work.

However, refinery instruments have neither the automobile's wide performance latitude nor the ability of a light bulb to publish its own ailments. A seemingly minor inaccuracy can upset an entire refining process. A measuring device might be working yet giving misinformation, or a controlling device might be working yet miscontrolling.

It readily can be seen, therefore, that modern instrumentation requires a great deal of preventive maintenance. We must have men in the field who understand these instruments and can keep them operating at top efficiency. Repairing an instrument in a shop or factory under ideal conditions is relatively simple compared with getting results from instruments in an operating unit.

Frequently our trouble-shooters, some of whom are on duty round the clock, receive trouble calls from various refinery units. Perhaps a pump is not operating properly or a valve somewhere is partially closed. Or perhaps a heating decline is evident despite the fact that an instrument has opened the fuel diaphragm valve as wide as possible.

An irregularity is naturally reflected in the instrument first. It is trying to tell the operator that something has gone wrong with one of the flows, temperatures, pressures or levels. The operator, with a multimillion dollar plant on his hands, has reason to be concerned and is naturally prompted to call for Instrument Department aid immediately. Such a course of action is preferable to "fussing" with instrument adjustments and thereby aggravating the real trouble.

The instrument man responds to an emergency promptly. His familiarity with the mechanism usually provides him with a clue as to what has gone wrong. If the instrument has failed, he may recommend that the unit be placed under manual control. If he finds the controller working as it should, he oftentimes assists the operator in running down a pipe line break, fuel failure, or other possible causes of an upset.

Every trouble-shooter can relate numerous anecdotes wherein instruments have been blamed for plugged towers, faulty pumps, closed valves, and even breaks in pipe lines. And undoubtedly many a candy bar has changed hands when the reliability of an instrument has been either proved or disproved.

For the purposes of preventive maintenance and daily references, our Department must necessarily keep accurate records. A history folder, containing drawings, instructions, calculations and performance records, is kept on all installations except those involving only simple pressure gauges.

Counting some 3000 pressure gauges, Los Angeles Refinery at present uses 7000 instruments for the measurement and control of temperature, pressure, flow and liquid level.

INSTRUMENT MAN

Instrument designers and research engineers have always kept ahead of industrial processes and have contributed largely to progress. But it is left to others to get successful results in the field application of every appliance. As wonderful as an instrument may be, much depends upon the persons using and caring for it.

Thus we come to the instrument man.

The modern refinery, with its wide scope of measurement and control, calls for the extensive use of practically all industrial instruments and their combinations. This circumstance presents the instrument man with a variety of interests, problems, studies and challenges. Nearly every trouble-shooting job, besides demanding skill and knowledge, calls for ingenuity and the ability to think straight. Everything from simple pressure gauges to electronic temperature controllers and cascade combustion control systems must be understood by him. In addition, he must have a very intimate knowledge of all refining and allied processes involved.

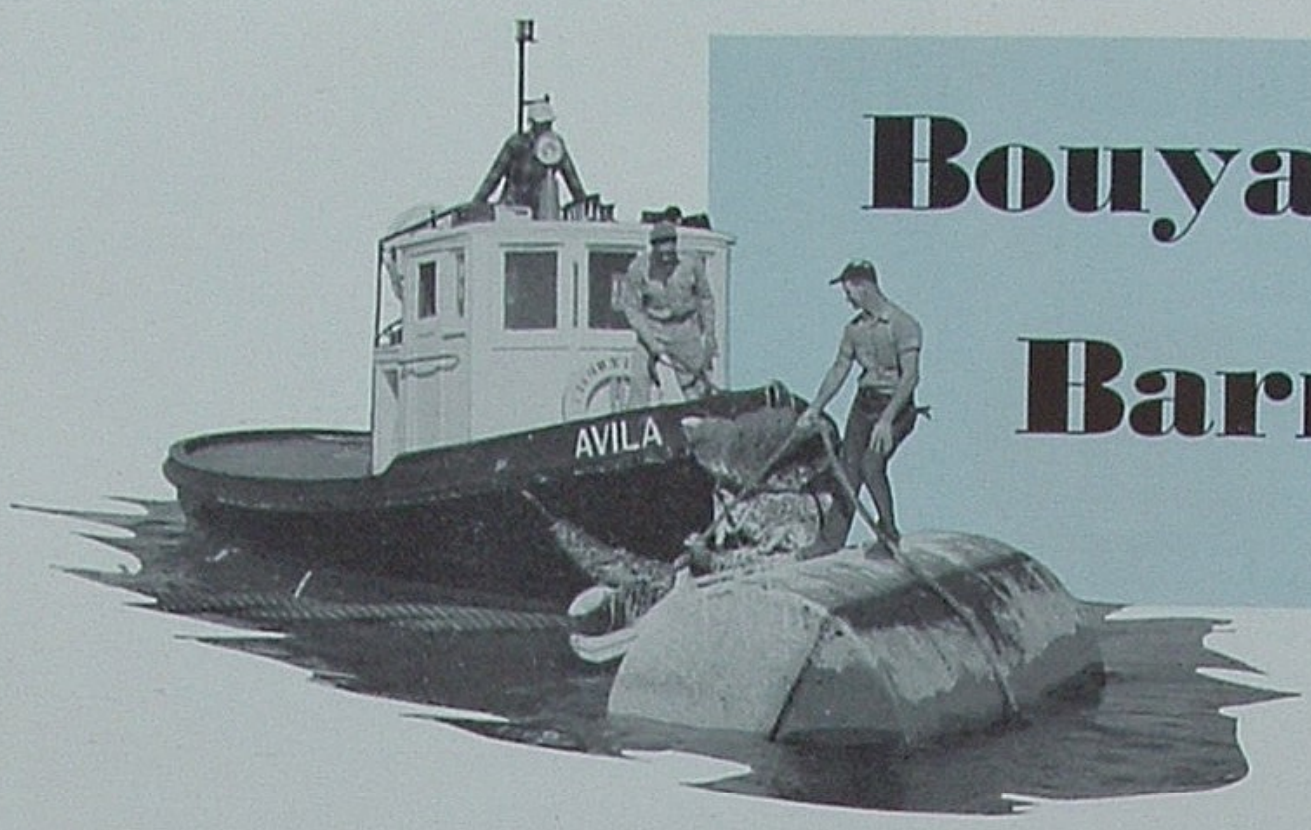
The work has attracted many very interested and enthusiastic men. Four of our number have been in the Department over twenty years. Seven have been with the Company over fifteen years.

The successful instrument man of today is a thoroughly skilled mechanic and something of a wizard at details. He knows his mathematics well enough to make almost daily use of algebraic formulas. He is familiar with the principles of physics and has a good knowledge of chemistry and chemical processes.

But, if his success is to continue, his interest and enthusiasm must extend beyond normal boundaries. He must constantly prepare himself for new problems that arise and for mechanical solutions that are bound to come tomorrow.

At Los Angeles Refinery we hold instrument discussion meetings every Monday evening. We call upon the best talent in our company and in Southern California to aid us when needed. We have an instrument library, a very complete instruction book file, and many of the best visual aids that can be devised. These facilities are available to all Instrument Department personnel to help them keep abreast of the times and obtain better results

(*Continued on Page 23*)



Bouyancy and Barnacles

Mooring buoys at Port San Luis are used to hold tankers safely away from the wharf while loading. The tug AVILA assists by hauling mooring lines to the buoys or untying departing vessels.

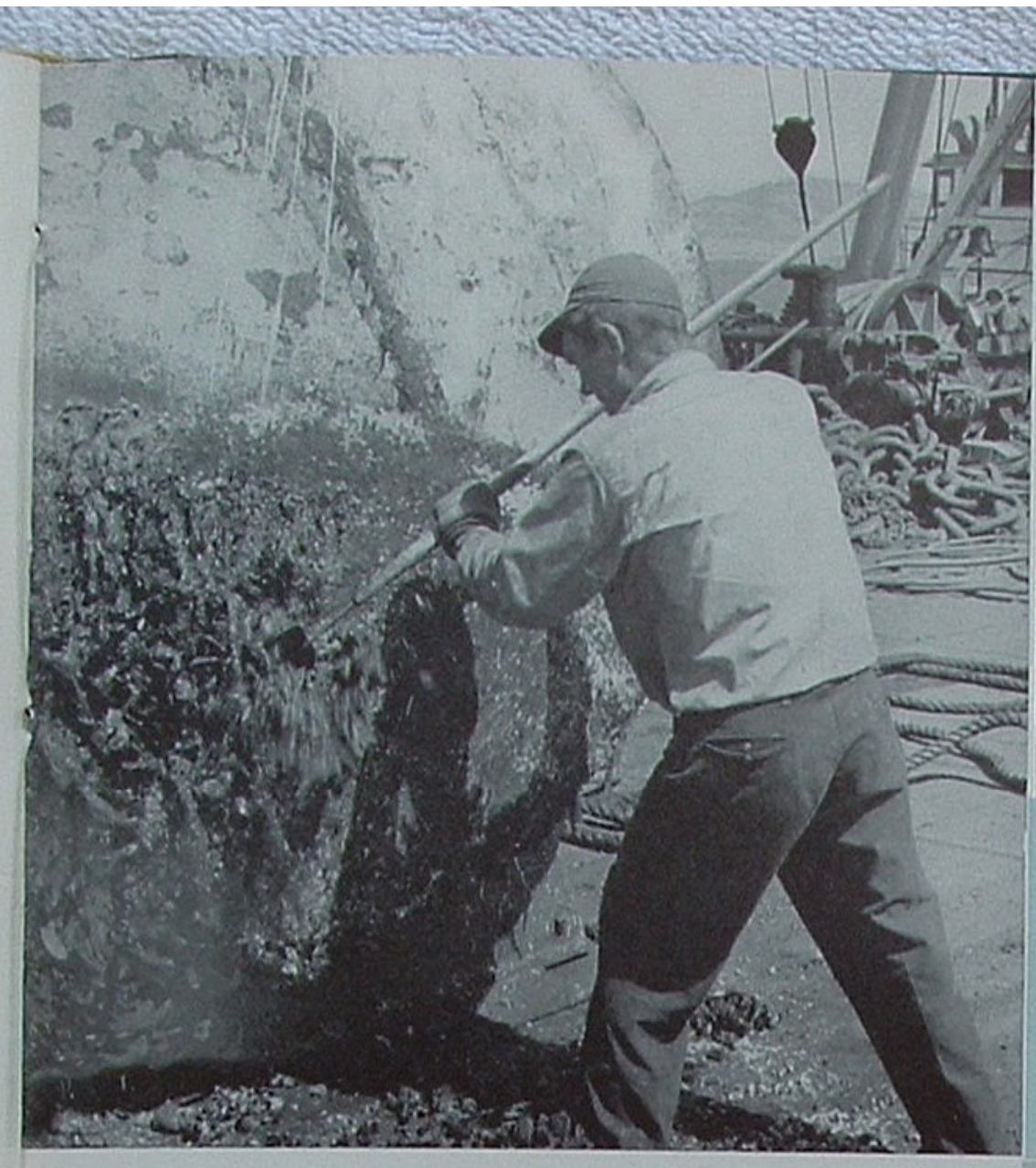
Once every two years the buoys, chains and anchors are raised for scraping, painting and replacement of weakened parts. In view is a horde of barnacles that have taken seaside residence.

AT PORT SAN LUIS, tankers tie up at a distance of twenty-five feet or more from the wharf in order to avoid being crushed against the pilings by restless ocean swells. Remaining at this safe distance during loading is made possible by securing the ships to buoys anchored in a semi-circular pattern several hundred feet from the wharf. The ships' lines are attached to and detached from these off-shore anchorages by employee-operators of the Union Oil Tug AVILA.

It would seem that anything as plain and sturdy as a buoy might endure longer than the oil industry itself, with never a need for repairs or maintenance. But these steel heavyweights are neither everlasting nor immune to the ravages of Father Neptune. At least once each year they must be inspected; and every two years the floating tanks, chains and anchors are raised, scraped free of barnacles, and painted.

The most vulnerable part of a mooring buoy is several feet of anchor chain that comes into frictional contact with sand on the ocean bottom. The constant movement of waves and tides supplies the power, particles of sand function as cutting tools, and in time an eight-inch link of steel is filed to the breaking point. Two years is about the effective working life of these dragging links. Then they must be removed and replaced.

Port Captain L. L. Lishman, who supervised a recent overhaul of buoys at Port San Luis and provided the accompanying pictures, also stimulated our curiosity. Whence come all those barnacles that attach themselves to every solid object beneath the ocean's surface? How do such motionless creatures ever reach a buoy in the first place?



Above: On board a 100-ton servicing barge, workmen with sledge hammers and a torch reunite the locking anchor with its chain.

Left: Barnacles manufacture their own brand of cement and cling so affectionately to the buoy that only scraping dislodges them.

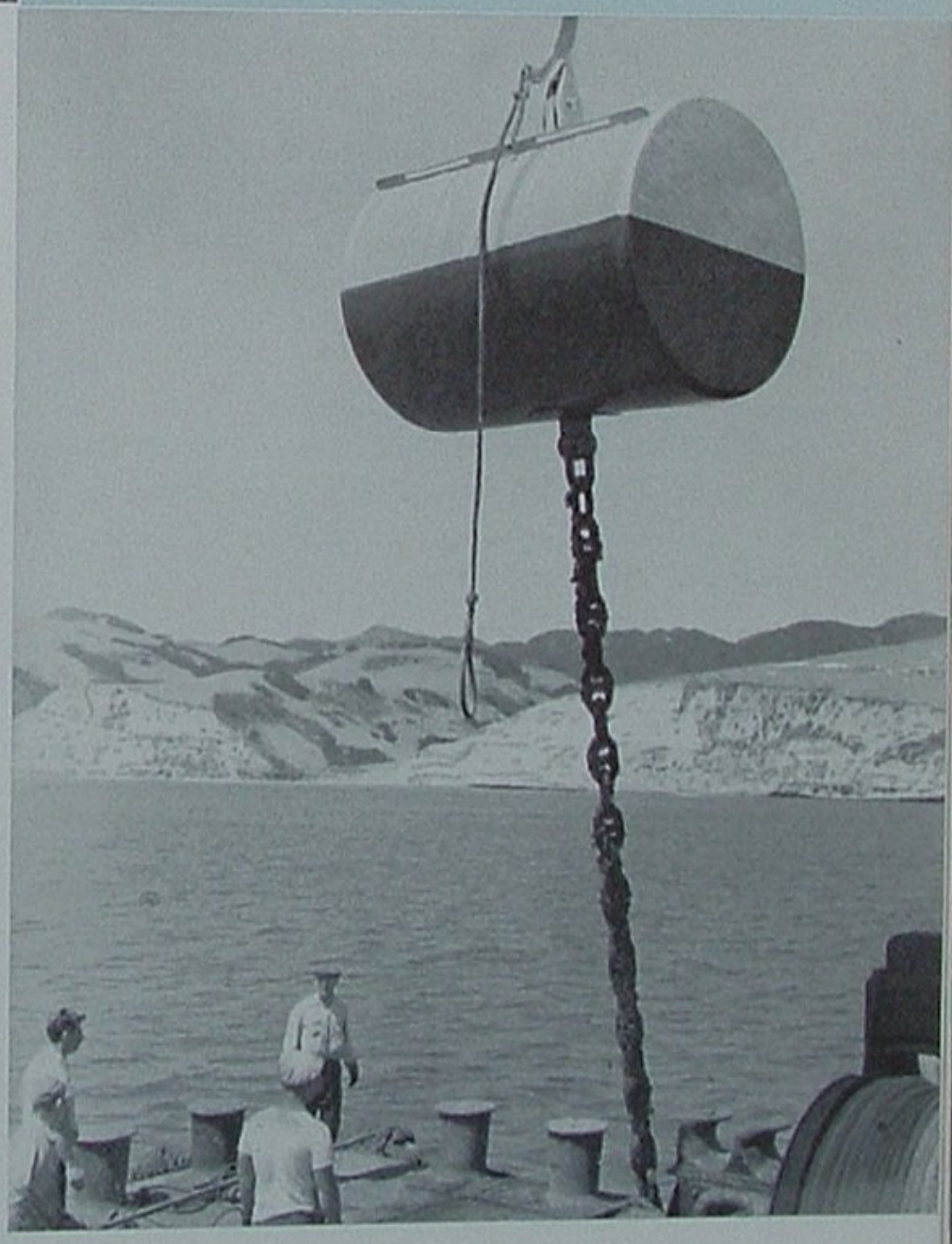
Below: Thoroughly cleaned and freshly painted with a toxic material, the buoy is ready for another two years of tanker service.

One Charles R. Darwin asked the same questions 100 years ago and, finding few good answers in the books, proceeded to investigate.

Of course you have seen thousands of barnacles in their adult stage clinging to the submerged portions of ocean piers and rocks. But in its nauplius or infancy stage, the barnacle hatches from an egg and resembles a tiny crayfish. It begins with one eye, then soon develops two compound eyes. With six pairs of swimming feet and two antenna or feelers, it moves about through the water in search of food and adventure.

Soon, like many a distant human cousin, it discovers the advantages of a sedentary occupation and decides to take life easy. Finding some solid object like a rock, piling, tanker hull or buoy, it atttaches itself by means of its antenna and a glandular secretion of cement. Slowly the feet of the nauplius become smaller (pinched), it takes on an encasement of hard shell (sophistication), and lives largely by repeatedly opening and closing its valvular mouth (gum-beating). Both sexes are generally united in one individual, although in some cases science gives the male credit for being parasitically attached to and utterly dependent on the female for food.

Buoy, what a life!



INDUSTRIAL SUMMARY

Highlights of Annual Report for 1948

Union Oil Company and industry in general had a good year in 1948, according to our annual report just released by the Board of Directors through President Reese H. Taylor:

Exploration and Production

Gross crude oil production increased 8 per cent over 1947 to a new record volume of 36,192,000 barrels. Despite this heavy production, the most intensive exploration and development program in Company history gave our proved crude oil reserves a net increase of 5,800,000 barrels over and above withdrawals. Of our 291 wells drilled during 1948, 235 were completed as producers. The Company's exploration program encompassed California, Washington, Montana, North Dakota, Wyoming, Utah, Colorado, New Mexico, Texas, Louisiana, Arkansas, Mississippi, the territory of Alaska, Alberta in Canada, and Paraguay.

Transportation

Our transportation system consisting of 1,149 miles of pipe lines, 7 tankships, 634 tanks cars, and 663 motor transports and trucks, operated at capacity levels throughout the year transporting crude to refineries and finished products to customer. Pipe lines delivered a total of 70,700,000 barrels. Company-owned and chartered tankships carried 42,639,000 barrels of crude and refined products. Improved facilities and methods enabled Company transport trucks to deliver 90 per cent of our service station gasoline requirements. A program of modernization was started that will effect further economies in operating costs and speed up in operations.

Research

Approval has been given for the construction of a Union Oil Research Center at Brea, California. The new center, which will consolidate all research personnel and facilities within a most modern unit, will be completed in 1950.

Among the Department's accomplishments during 1948 was the development of a seemingly very practical method for removing sulfur and nitrogen from petroleum distillates. Also, they developed a new barium grease which promises to combine the advantages of Unoba, a general purpose industrial grease, and Unoba A, a general purpose automotive grease. Laboratory work was completed on a process for the manufacture of water-soluble detergents from petroleum base stocks, which yields a finished product of high quality. Two drilling muds have been developed, which excel other fluids of their type for cooling drill bits, carrying cuttings to the surface, and maintaining pressure control.

Shale Development

The Company's shale holdings near Parachute Creek, Colorado, increased in potential worth with further advancements in mining, retorting and refining experiments. The U. S. Bureau of Mines, in cooperation with various oil companies, has successfully proved through a "demonstration" mine that the shale rock can be mined on an economic basis. Union Oil's 50-tons-per-day retort pilot plant has demonstrated its advantages over all other oil-extraction methods that have been tried on Colorado shale. A catalytic hydrogenation process developed by the Company is applicable to the removal of both nitrogen and sulfur compounds from shale oil, yielding a product that can be successfully refined with existing refining equipment and processes.

Marketing

Income during 1948, amounting to $208,985,000, represented a 22 per cent increase over 1947, previously the largest dollar-volume year in Company history. At times during the year our refineries had difficulty keeping pace with public demand for "76" and "7600" gasolines and military purchases of high octane aviation gasoline. Eighteen distributing stations were purchased in Montana, giving us marketing representation in 9 additional counties. More than 50 independent business men became associated with the Company by purchasing sites and erecting their own service station buildings.

Personnel

Salaries and wages for all Union Oil Company personnel amounted to $34,517,000 in 1948, as compared to a total payroll of $32,610,000 in 1947. Most employees, both union and non-union, received a wage increase comparable to 12½ cents per hour retroactive to July 3, 1948. This brought the total increase since 1941 up 83 per cent, whereas, according to the Department of Labor's Consumer Price Index, living costs had risen only 70 per cent during the same period of time. Unfortunately, however, many refinery workers suffered severe wage losses by reason of being out on strike for 128 days. Management commended all employees who showed their sincere interest and cooperation throughout the year.

Manufacturing

Refinery throughput during 1948 exceeded the 1947 record by more than 4 million barrels despite a strike of several months' duration. At Los Angeles Refinery a plant is being constructed to recover hydrogen sulphide from stack fumes, thereby eliminating possible sources of smog and producing a product that has commercial uses. The production of Triton type oils at Oleum Refinery will be increased 140 per cent with the completion in October, 1949, of our modernization program.

Earnings and Dividends

Union Oil Company's earnings for 1948, after meeting preferred dividend requirements, totaled $30,355,647 or $6.51 per share on the 4,666,270 shares of common stock outstanding. This compares with earnings of $17,973,360 or $3.85 per share in 1947.

The increased profit must be analyzed in the light of today's inflation. For despite a substantial increase in the number of dollars earned, it was necessary to plow back into the business 53 per cent of the reported net profit in order to offset the tremendous rise in the cost of replacing properties and facilities and to maintain the Company's market position.

However, the favorable earnings did enable the Board of Directors to increase quarterly dividends on common shares from 35 cents to 62½ cents per share. Dividend payments for 1948 amounted to $1.95 per share as compared to payments of $1.10 per share in 1947.

PUBLIC RELATIONS A book describing the complete history to date of Union Oil Company is already in the literary mill. The author will be Frank J. Taylor, a veteran newspaperman who has other books and hundreds of magazine articles to his credit. He is a regular contributor to THE SATURDAY EVENING POST. Assisting Mr. Taylor in gathering historical facts and photographs is Earl Welty of Honolulu. These gentlemen are being extended Company-wide cooperation in obtaining book material. It is hoped that copies will be off the press by our 60th anniversary in October, 1950.

FIELD Recent developments in the San Joaquin Valley have in some measure stolen the limelight from our Coast Division in California. While drilling activity in northern Santa Barbara County has been reduced considerably, due to the oversupply of heavier oil, recent discoveries in San Joaquin Valley will cause the drilling of not less than four wells during the next month. The second Union well in the Jacalitos Field, Son Fee 65-20, was scheduled for spudding by the middle of March. Two wells in the Kern Bluffs area, Miller 2 and 3, were to be drilling before the end of March, and Frazier Trust 15-24 in the Canfield Ranch area is preparing foundation.

An interesting operation is being conducted in the La Habra area of Los Angeles Basin, where a completely sound-proof derrick is being used to drill Sansinena 18 located in a residential area. Oil was discovered in a buried anticline located in the La Habra Hills by the completion of Sansinena 15 on May 24, 1945. It is planned to define and develop this field by directionally drilled wells from central drill sites.

In the Gulf Division we are now drilling our first well in the Corpus Christi area, and location has been made to drill on the Blue Lake Prospect, our first well in Sabine Parish, Louisiana. The airline distance between these two locations is approximately 400 miles.

In West Texas, Frost 1, a wildcat in Coke County, has given indications of being a small well but is still testing.

The second Egert well at Fiddler Creek in Wyoming has been completed but, due to bad weather, it has been

impossible to make a conclusive test. Other Rocky Mountain Division operations continue to be hampered by severe winter weather.

MARKETING For some time the American Locomotive Company has been conducting tests on T5X for use in diesel electric locomotives and this oil has now been placed on their "approved" list. Similar tests are being conducted by the Electromotive Division of General Motors Corporation.

The Company is planning to distribute through retail outlets a million copies of the Pacific Coast Baseball League's 1949 schedule. This schedule is prepared in unique form and shows *what* team is playing *where* on any given date. It will carry appropriate Union Oil advertising.

MARINE Ships were chartered for three voyages to the Northwest during February because of the continuing shortage of tonnage that first began developing in January. Abnormally cold weather and new fuel oil business in that area taxed our transportation facilities.

Heavy swells and high winds encountered during the latter part of February brought about hazardous loading conditions at our open roadstead terminal at Port San Luis. It became necessary to suspend loading operations entirely on one occasion.

Voyages were made to the Hawaiian Islands and to Alaska during the month. The SS VICTOR H. KELLY was decommissioned for six days to permit drydocking and voyage repairs. All ships were otherwise engaged solely in domestic coastwise operations.

According to the Annual Report for 1948: "The Company is contemplating a long range program of replacing tankships at fairly uniform intervals to avoid group replacements in the future, and it is expected that construction of a new 16,500 ton tanker will be started in 1950."

FRANK H. OTT At a meeting of the Lubrication Committee of the American Petroleum Institute held in St. Louis February 21 to 23, Frank H. Ott of Head Office Sales Services delivered a paper based on the Company's experience with Unoba Grease. His talk was entitled, "Modern Greases Mean Simplified Lubrication." At this meeting the Committee took action seeking to reduce the number of motor oil classifications from the present nine to four.

FRED L. HARTLEY Our successful experiments in processing Colorado oil shales were brought to public attention through front-page newspaper reports published on March 9, following a regional meeting of the American Institute of Chemical Engineers held in the Biltmore Hotel, Los Angeles. Fred L. Hartley, process supervisor in our Manufacturing Department, addressed the meeting and was quoted prominently in the newspaper accounts.

ROGER M. CLARK On February 1, Roger M. Clark moved up to the resident manager assignment at San Jose following over four years of sales experience in San Francisco and Oakland. He is a graduate of San Jose State College where he majored in chemistry, physics, English and law. He also studied at the Oakland College of Laws for a year before joining Union Oil Company on October 2, 1944, as a salesman in San Francisco.

INSTRUMENTATION—cont .from page 17

with equipment in the field. We issue technical bulletins on new instruments, new methods, new installations and new problems as soon as we hear of them.

It has been said that instrumentation reduces the sum total of waste and drudgery, thereby enabling people to have more and better food, clothing, houses, books, cars, petroleum products and goods of all kinds and also to have more and more leisure. No one better realizes the truth of this assertion than men who work with instruments and sense their potentialities. Great as has been our progress during the past quarter-century, we feel confident that even greater strides will be made in the next twenty-five years.

SERVICE BIRTHDAY AWARDS

APRIL, 1949

Thirty-Five Years

Correll, Chas. E., No. Div. Pipe Line

Thirty Years

Crawford, Adolph, So. Div. Field
Danieley, Howard, So. Div. Field
Decker, Leon E., Northwest Territory
Hadley, Russell D. H.O. Comptroller's

Twenty-Five Years

Comstock, Ward M., L.A. Refinery Mfg.
Emerson, Erroll E., Oleum Refinery Mfg
Kernan, Walter P., So. Div. Pipe Line
Kolar, Wm. T., Southwest Territory
Munro, Fred C., L.A. Refinery Mfg.
Nicholls, Lisle H., H.O. Comptroller's
Peterson, Albert J., Northwest Territory
Sather, Edwin L., Northwest Territory
Van Kleek, Walter R., Northwest Terr.
Wensel, Gottlieb, So. Div. Field

Twenty Years

Aitchison, John, Northwest Territory
Allen, Kenneth F., Oleum Refinery Mfg.
Burgraff, Cletus C., L.A. Refinery Mfg.
Cox, Ambrose S., So. Div. Field
Dailey, Lawrence L., Central Territory
Goodwin, Paul H., Southwest Territory
Hayes, Oscar C., L.A. Refinery Mfg.
Miller, James H., L.A. Refinery Mfg.
Montgomery, John Y., So. Div. Field
Normoyle, Thomas W., Northwest Terr.
Rathbone, Chas. E., Jr., H.O. Sales Serv.
Russell Othir R., Oleum Refinery Mfg.
Six, Kenneth F., Southwest Territory
Svirbely, Emma R., Central Territory
Walker, Carl A., L.A. Refinery Mfg.

Fifteen Years

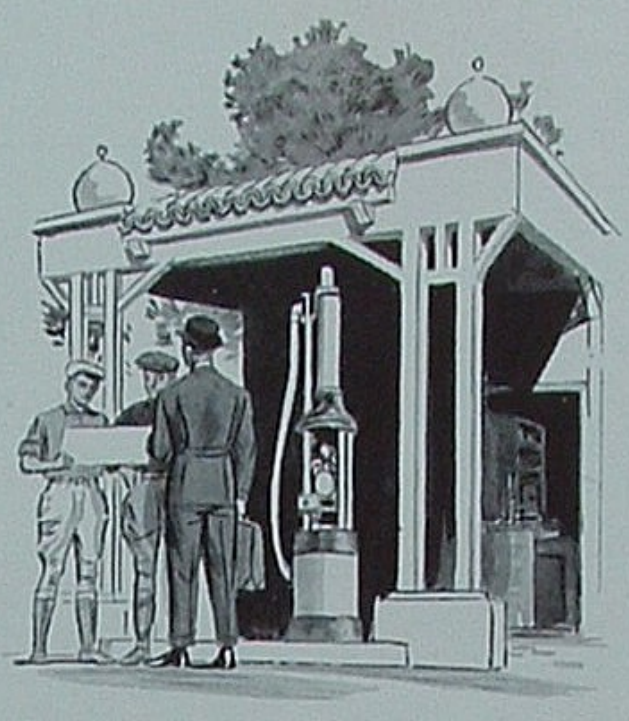
Forden, Earl R., Oleum Refinery Mfg.
Aho, Jouko H., Central Territory
Anderson, John Ross, Valley Div. Field
Cobine, Ralph W., So. Div. Field
Engen, Erling C., Central Territory
Fagan, Wilbur T., So. Div. Field
Gerlich, William P., So. Div. Field
Johnson, Elmer E., Central Territory
Littell, Estel B., No. Div. Automotive
Martin, William S., Southwest Territory
Munroe, Gilbert C., So. Div. Field
Murray, Berle T., Oleum Refinery Mfg.
Parker, Arthur G., Northwest Territory
Weld, Arthur S., H. O. Building
Wren, Jack F., Oleum Refinery Mfg.
von der Hellen, Donald G., N.W. Terr.

Ten Years

Basten, Clarence Wm., Oleum Refin Mfg
Beyersdorf, Rudolph R., Northwest Terr.
Franklin, Todd L., Central Territory
Kelley, Larry D., Northwest Territory
Macedo Wm. Ed., Oleum Refinery Mfg.
Mealiffe, Alfred E., Central Territory
Pearson, Bernard V., Oleum Refin. Mfg
Saunders, Leonard H., Oleum Refin Mfg

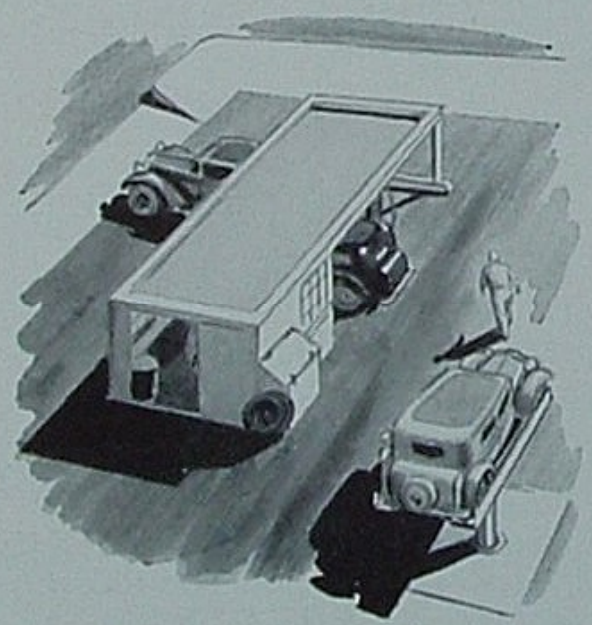

The Pagenkopp brothers' story

1. When the Pagenkopp brothers finished school in Los Angeles during World War I they both went to work for the railroad —Willard as an apprentice mechanic and Edmund as a roundhouse clerk. But by 1922, when both brothers were married with families started, they got the urge to go into business for themselves.



2. Since neither one had any capital, this wasn't the easiest thing to manage. But after scouting around they found that Union Oil Company was willing to rent them a service station in Santa Ana, California, for $35 a month and set them up in business. They took the station over. During the first year their earnings averaged $200 apiece per month.

3. During the next 6 years, as their business grew, they managed to save up $6,500 between them. Then they went to Union Oil again. The northwest corner of Main and Walnut in Santa Ana was for sale for $41,000. They wanted to buy it and put up a $10,000 service station. $6,500 wasn't much of a down payment. But with Union Oil's backing and the brothers' business reputation, the deal was put over.



4. A few months later they moved in and started paying off the mortgage. Today the Pagenkopp brothers' complete, one-stop Union Oil Service Station does an annual business of $100,000. Bill and Ed employ 5 men and a bookkeeper in addition to working themselves. The business is free and clear. And their property—including station and facilities which were modernized and expanded in 1941—is valued at $85,000.

5. In addition to all this, Ed and Bill are members of the Chamber of Commerce. Both take an active part in Santa Ana civic affairs. Ed owns a ranch in Ventura County. And Bill owns a 10-acre orange grove near Santa Ana. To us the story of the Pagenkopp brothers exemplifies another of the many benefits inherent in a free, competitive oil industry. Union Oil, like every other oil company, is in constant competition for *customers*.

6. Consequently, *it is to our advantage* to help provide facilities for dealers who can *get* those customers. As a result of this competitive situation, a qualified man can go into the service station business with less capital than is required in almost any other field. And thousands of men throughout the country—who otherwise might never have the chance—are given an opportunity to build an independent business for themselves.

UNION OIL COMPANY

OF CALIFORNIA

INCORPORATED IN CALIFORNIA, OCTOBER 17, 1890

This series, sponsored by the people of Union Oil Company, is dedicated to a discussion of how and why American business functions. We hope you'll feel free to send in any suggestions or criticisms you have to offer. Write: The President, Union Oil Company, Union Oil Building, Los Angeles 14, California.