

GEAR TOOTH  
STRESSES

THE TEXACO STAR  
SPRING 1948



DESERT OIL goes aboard an affiliated company's tanker in the Persian Gulf region for shipment to the United States Navy. Petroleum produced and refined by companies in the Middle East in which Texaco has an interest is helping to supply the United States and its allies in the Eastern Hemisphere. Development of oil resources in these desert countries is helping to relieve the drain on Western Hemisphere supplies

# THE TEXACO STAR

Spring, 1948

VOLUME XXXV

NUMBER 2

## CONTENTS

This Is Where We Stand Today.....	2
More Oil for Tomorrow.....	4
Jet Propulsion .....	8
Texaco Grant Aids Atomic Research .....	9
Star Close-Ups—"Card Trick".....	10
Throwing Light on the Subject.....	14
Unbelievable Opera, by George E. Sokolsky.....	15
Speed Pays Dividends, by H. A. Murray.....	16
Adams County Get-Together .....	18
They're Learning by Doing .....	20
Spinning Better Yarns.....	22
Texaco "Green Thumb" Vets Start Freedom Gardens.....	24
Products Now Moving Through Wyco Pipe Line.....	24
New Book Describes U. S. Oil Operations Abroad.....	24

## A PUBLICATION OF THE TEXAS COMPANY

For Stockholders and Employees

W. S. S. RODGERS, Chairman of the Board of Directors; HARRY T. KLEIN, President; M. HALPERN, B. E. HULL, J. S. LEACH, R. OGARRIO, C. E. OLMSTED, R. L. SAUNDERS, JAMES TANHAM, and TORREY H. WEBB, Vice Presidents; OSCAR JOHN DORWIN, General Counsel; W. G. EICKER, Secretary; L. H. LINDEMAN, Treasurer; ERNEST C. BREEDING, Comptroller, 135 East 42nd Street, New York 17, New York. . . . Published by the Public Relations Department, Philip C. Humphrey, Manager; Wilfred B. Talman, Editor, Company Publications Division; Ellis Prudden, J. Lawrence Filson, Martin T. Gengerke, Associate Editors. Printed in the U. S. A.

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# Brief AND TO THE POINT

★AN ALL-OUT EFFORT will be made by the American oil industry this year to overtake expanding demands for petroleum, according to the annual review and forecast issue of *The Oil and Gas Journal*. More and deeper wells are expected to be drilled than ever before in history, more miles of pipe line will be laid, and the industry will conduct the largest refinery construction program of any peacetime year.

★YOUNG MEN, who were once told by Horace Greeley to go West if they wanted to make their fortunes, may well ponder the future of both synthetic gasoline and atomic energy, in the opinion of Waldemar Kaempffert, science editor of *The New York Times*. "The West is well populated at this late day," Mr. Kaempffert points out, "but there is no limit to the possibilities that lie in research. Young students in our technical schools would make no mistake if they so shaped their training that they could make the most of the opportunities that await them in petroleum refining, in synthesizing petroleum products, and in developing atomic energy."

★MORE THAN ONE-FOURTH of The Texas Company's entire research program is being concentrated on methods of making synthetic fuels. Currently, some 12 pilot units are being operated on various phases of the expanding project. These range from small "bench model" units at the Company's center for fundamental research at Beacon, New York, to the large, semi-commercial units at Montebello, California.

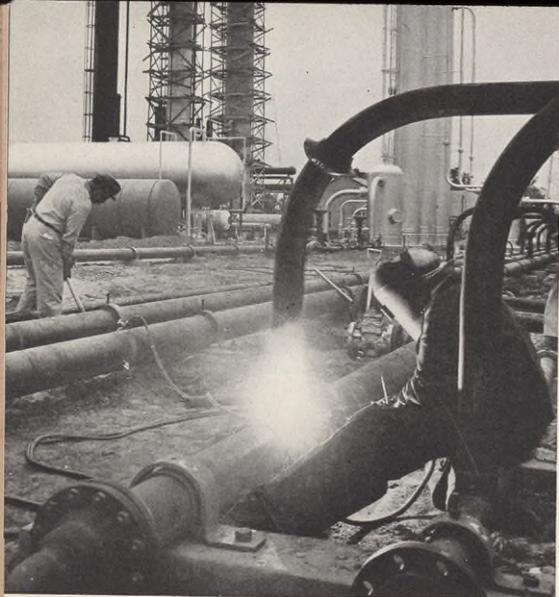
★CAR REPAIR BILLS throughout the country will total about \$7,000,000,000 in 1948, according to a forecast by the Automobile Merchants Association of New York. For some years to come, factory experts predict, business of this type will range at least 30 to 35 per cent above the pre-war high. "This is substantiated by the fact that the average car's life has been lengthened to 89,600 miles during a 12-year life span, compared with 58,000 miles and 8.3 years service in 1935 and 25,750 miles and 6.5 years in 1925," the association's report states.

★THE PRECISION achieved in tests conducted by the Standardization Group of Texaco's Beacon Laboratories received official recognition early this year. Beacon's Products Application Department's knock rating group placed first in the National Coordinating Fuel Research-Motor Fuels Division exchange group testing of samples for 1947 by the Research procedure and second, beaten only by the National Bureau of Standards, by the Motor method. This exchange group consists of 20 testing laboratories, among which are the laboratories of many leading petroleum refiners.

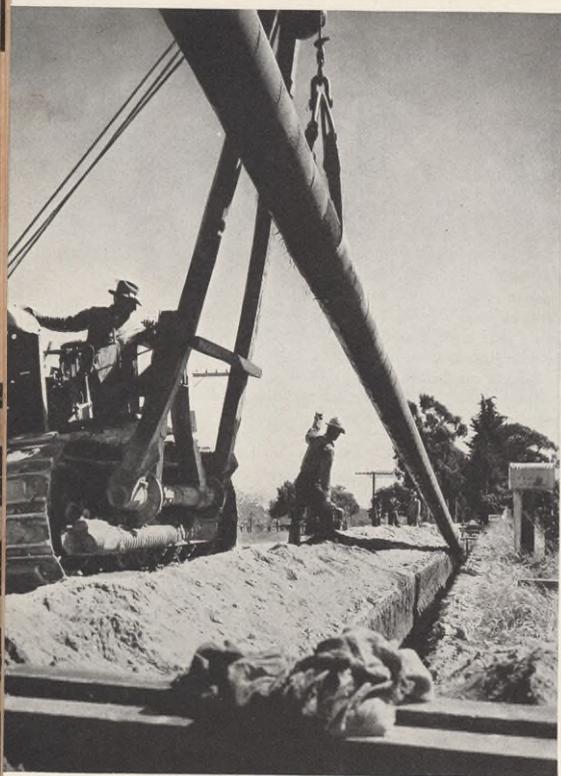
### THE COVER

★THE WORDS "Gear Tooth Stresses" on the cover of this issue are a clue to what the riot of color is all about. This reproduction was made from a color photograph. For further details see "Throwing Light on the Subject," which appears on Page 14.

# THIS IS



Expansion is under way . . . .



. . . . throughout the industry . . . .

IN A WORLD that is changed as well as changing, it is timely to consider where The Texas Company and the industry of which it is an important part stand in 1943.

This issue of THE TEXACO STAR touches upon such significant topics as synthetic oil, nuclear fission, and jet propulsion. These subjects, as current news reports show, bear importantly on the future of the petroleum industry. It is hoped that readers of THE STAR will gain some insight, from this issue, of The Texas Company's relationship to these developments.

For the petroleum industry, the same as for other business, the post-war world has proved unpredictable. What was once "normal" in the oil business probably never will be so again. As STAR readers learned in the last issue, more crude oil and finished products are being produced in this country today than ever before. The present high levels are expected to rise still higher in the future.

THIS YEAR, the industry faces an unprecedented situation not only in the field of supply and demand. Before the first anniversary of Pearl Harbor, THE TEXACO STAR pointed out that World War II was "the toughest of all wars" on capital. The uneasy peace following hostilities is also tough on capital.

In addition to being hard pressed to supply all the petroleum consumers could use, the industry is also faced with a staggering need for capital. Vast outlays of money are needed now to provide additional facilities for producing crude oil as well as for finding crude oil reserves, and for manufacturing and distributing finished products.

"The high cost of living has hit corporations, too," points out a recent advertisement of The Warner & Swasey Co., machine tool manufacturers. As individuals, each of us is keenly aware of the reduced value of our money today in terms of food, clothing, housing, fuel, and all the other items that make up our living costs. Money has similarly depreciated in value for business.

The hard fact is, today's business dollar in many cases is worth even *less* than the consumer's dollar, which now buys less than two-thirds of what it did in the 1935-1939 period. The depreciation of the business dollar, combined with the enormous need for capital, makes a major problem for the petroleum industry in 1943.

Under these circumstances, current profits earned by units of the oil industry are misleading. Under accepted accounting practices, large sums of money

# WHERE WE STAND TODAY

which in reality are needed to replace capital equipment at current prices are of necessity classified as profits.

To illustrate: The Texas Company's capital investment program over the next two years calls for expenditures of approximately \$375,000,000. Although some of this money will come from the proceeds of the stock issue last Fall, and loans may furnish another portion, a very substantial amount of the funds needed must come from earnings.

The following excerpts from an editorial in *The Saturday Evening Post*\* highlight the rise in corporate living costs:

"Government bodies and private commentators vie with one another to dazzle the rest of us with figures purporting to show the vast profits which the corporations are making, while ordinary people have more than they can do to stretch their incomes to cover the cost of living. Talk about huge profits, surpluses, and bank balances belonging to corporations has obscured the real story about the plight of American corporations after the war—namely, that they will be desperately short of capital as soon as material is available for providing new tools and rehabilitating their worn-out plants.

"... The large profits and surpluses now assumed to be making investors rich represent only a fraction of the money needed to replenish this deficit in capital—that is to say, to re-equip American industry for the job of producing the things which Americans, to say nothing of the other peoples of the world, so urgently need. In so far as the tax laws of the nation permit it, depreciation reserves are set up by corporations to replace worn-out and obsolete property at original cost. The amounts, which seem staggering when sent out over the news-agency wires as '50 per cent increase in profits over 1939,' do not bulk very large when set beside the amounts our corporations will need to keep abreast of technical progress and world demand for goods."

Speaking to fellow senators in the United States Senate last December on the subject "Production and Prices of Petroleum Products," Senator E. H. Moore of Oklahoma said:

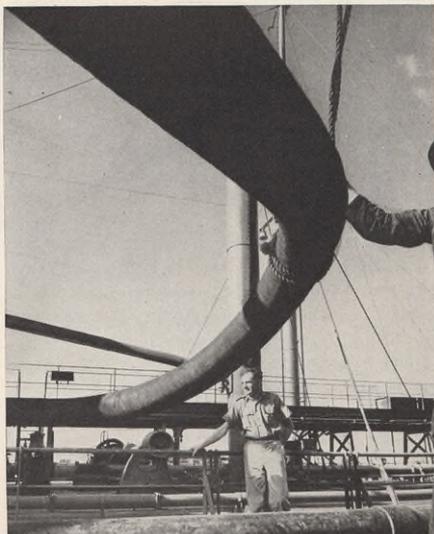
"... In recent months I have heard a great many individuals quoting large profit figures of certain units of the oil industry, but I doubt if those who condemn these supposedly large profits understand that they do not represent actual profits at all but,

in fact, the sale of capital assets of the oil companies. Any company that is forced to sell oil below replacement cost, even though the present sales price may be much higher than the original discovery cost, is in the process of liquidation. The merchant can usually currently replenish his inventory at wholesale costs below retail prices. An oil company, however, is engaged in producing and merchandising an irreplaceable natural resource that cannot be bought upon the open market from the manufacturer. The oil company must assume the financial hazard of going out in search of new sources of supply."

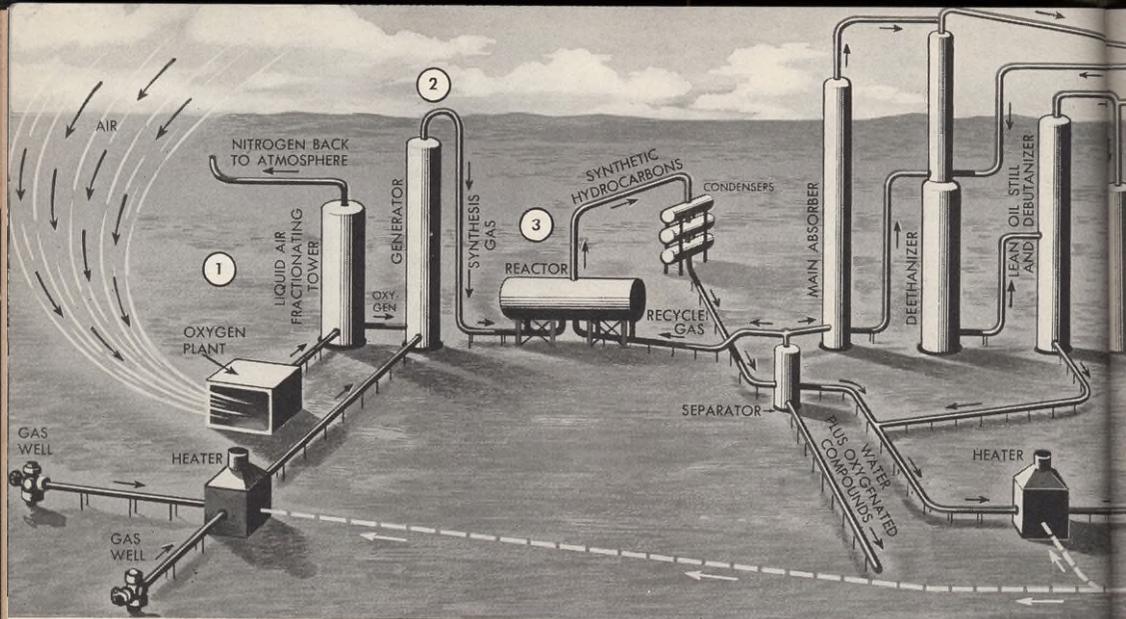
**F**AR FROM BEING too large, profits of oil companies today are, in fact, not great enough to keep pace with the "living costs" with which the companies are faced. The industry's current expansion program involving expenditures of more than \$4,000,000,000 is in the interest of the public, which is demanding more petroleum products than ever before. Although oil company profits generally are high, in line with sales, a greater proportion of these profits than ever before is being plowed back into the business so that the public may be adequately supplied.

The Texas Company, along with other units of the petroleum industry, at present faces unusual conditions here and abroad. The old "normalcy" has given way to enlarged concepts of petroleum's rôle in world economy. More and more money is needed to gear the industry to its new rôle. Texaco is meeting the challenge of today through far-sighted decisions in all phases of the Company's operations.

... to increase oil supplies



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# MORE OIL FOR TOMORROW

**A dream is coming true at Brownsville, Texas, where a plant will soon convert natural gas to liquid fuels**

**S**OON, your car may run on synthetic gasoline. Synthetic fuel in commercial quantities is about to become a reality in the United States because of the vision and courage of the group of stockholders composing Carthage Hydrocol, Inc., which is now constructing, near Brownsville, Texas, the first projected commercial plant to utilize the Hydrocol process in the United States. Stockholders of Carthage Hydrocol, Inc., include The Chicago Corporation, Forest Oil Corporation, LaGloria Corporation, Niagara Share Corporation, Stone & Webster, Incorporated, United Gas Corporation, Western Natural Gas Company, Hydrocarbon Research, Inc., and The Texas Company. Of these, The Texas Company is the largest stockholder.

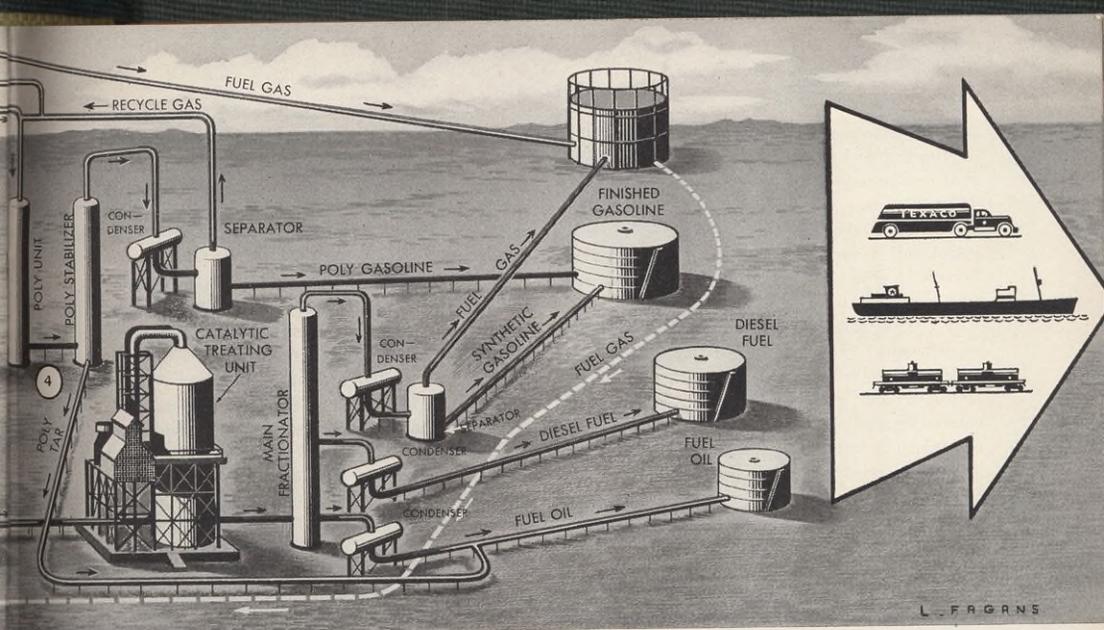
Officers of Carthage Hydrocol, Inc., are Guy George Gabrielson, president; F. M. Dawson, vice president; Allen K. Brehm, treasurer; and Albert L. Wolfe, secretary. The Brownsville plant staff will be headed by R. H. Aitken as superintendent. Dawson and Aitken were Superintendent and Assistant Superintendent, respectively, at Texaco's Lawrence-

ville Works before assuming their present duties.

The Carthage Hydrocol plant is being designed by Hydrocarbon Research, Inc., on data obtained chiefly through its own research and that of The Texas Company. The plant is being constructed by Arthur G. McKee and Company of Cleveland, Ohio.

The plant at Brownsville, when it swings into operation, will produce 7,500 barrels a day of liquid products including enough gasoline each day to fill the tanks of 14,000 automobiles, plus enough extra to fly a squadron of airplanes around the world—this without drawing upon our crude oil reserves.

Brownsville is an ideal location for the first commercial plant to use the Hydrocol process to produce synthetic motor fuel from natural gas. It is the southernmost city of Texas, located on the Rio Grande River, near the west shore of the Gulf of Mexico. The Carthage plant itself is on the Brownsville ship channel eight miles from the city and 17 miles from the Gulf. This channel will make possible the shipment of Hydrocol products by ocean-going tankers to the markets of the world.



**THE HYDROCOL PROCESS** for making synthetic fuels is shown in the above illustration. Simplified for clarity, it shows that the manufacture of oxygen (1) is the first step in the conversion of natural gas to liquid fuels and chemicals by this revolutionary method. At the Brownsville, Texas, plant of Carthage Hydrocol, Inc. (in which The Texas Company is the largest stockholder), air at a daily rate of 280,000,000 cubic feet will be compressed, cooled, liquefied, and fractionated to produce 53,000,000 cubic feet a day of oxygen.

Next step is to make synthesis gas, a mixture of carbon monoxide and hydrogen. This is accomplished by burning natural gas (methane) and oxygen in the generator (2), to which will be fed some 90,000,000 cubic feet of natural gas a day. The generator will yield synthesis mixture at daily rate of 230,000,000 cubic feet.

Third step in the Hydrocol process takes place in the reactor (3). Here, the synthesis gas comes in contact with a finely powdered catalyst suspended in the reactor by the up-flowing charge vapor, causing a chemical

reaction between the CO and H to produce synthetic hydrocarbons.

In the last phase of the process (4) occur the various recovery and finishing steps. These are, for the most part, conventional refinery procedures used in finishing gasoline, Diesel fuel, and fuel oil. By-product chemicals produced in the Hydrocol operation will be processed for marketing in a nearby chemical plant.

Efficiency of operation has been a prime consideration in the designs for the Brownsville plant, and by-product energy will be utilized in a number of interesting ways to lower production costs. For example, water circulating through cooling coils in the synthesis gas generator and the reactor will be converted into steam sufficient to drive all the pumps and compressors in the plant. The power obtained in this way will make it possible to produce the vast quantities of oxygen needed at a cost of less than five cents per 1,000 cubic feet.

Estimated daily yields from the plant are: gasoline, 6,000 barrels; gas oil, 900 barrels; fuel oil, 200 barrels; chemicals, 300,000 pounds.

Less than 60 miles away are the practically untouched natural gas fields of San Salvador, Santa Maria, La Blanca, and Mercedes. Here, under a pressure of several thousand pounds, is available sufficient gas upon which to operate the Carthage plant at full capacity for years to come. This gas will be transported, through pipe lines owned by Carthage Hydrocol, to the plant limits at Brownsville under full working pressure without requiring compressors.

The Hydrocol process, which is something entirely new on the nation's industrial horizon, is now hitting the petroleum industry with an impact greater

than was felt when "cracking" was introduced some 20 years ago. It is not just a better way of making fine gasoline. Neither is it a process for making a "substitute" or *ersatz* gasoline—terms which to the public mind connote a product not as good as the original.

Unlike "cracking," which breaks down heavier hydrocarbons into lighter hydrocarbons, the Hydrocol process is a means of synthesizing, or building up, premium-quality gasoline by burning natural gas with oxygen under carefully controlled conditions to give carbon monoxide and hydrogen and then passing this mixture over a catalyst in the proper

proportions to produce primarily gasoline and Diesel oil, together with by-product chemicals. In effect, the Hydrocol process transfers a substantial portion of 163 trillion feet of natural gas to our petroleum reserves. If all this gas were used for synthesizing petroleum, it would be equivalent to 16.3 billion barrels of crude, or reserves for more than nine such years as 1946.

In 1905 a French chemist, Paul Sabatier, who was experimenting to find a way to enrich "city gas," which was made from coal, found that by passing hydrogen and carbon monoxide over a nickel catalyst he was able to produce methane, the chief constituent of natural gas. This methane, added to the "city gas," greatly increased its heating value. But Sabatier's process was so expensive that it has never received wide commercial use.

Years later German scientists brushed the dust from Sabatier's process, and began a serious attempt to make fuels from sources other than crude oil. They reasoned that if methane, the simplest of natural hydrocarbons, could be made synthetically, why not more complex hydrocarbons, such as gasoline and Diesel oil? Their work was interrupted by World War I, but in 1920 the Germans resumed research in this field, and came up with the so-called Fischer-Tropsch process.

Low-grade brown coal, which Germany had in abundance, was the basic raw material for this process. By reacting the coal with steam, they produced a mixture of carbon monoxide and hydrogen, which, when passed over a catalyst, produced gasoline, Diesel oil, and wax. Unwieldy, inefficient, and costly, the process yielded such a poor grade of gasoline that it had to be blended with higher grades of gasoline to be used at all.

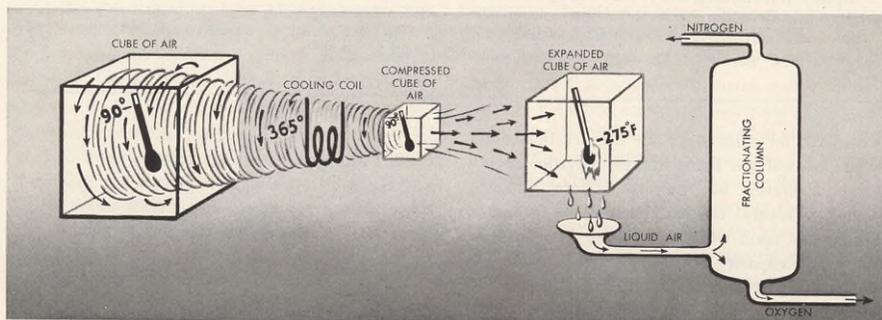
Information on the process was released in 1925, and The Texas Company and other American oil companies promptly became interested. But they quickly found that the yields and quality of products, together with the high cost, made the process unattractive.

But the Americans were convinced that the idea was basically sound, and that starting from scratch they could develop a process that would turn out synthetic products which could compete with crude oil products on a free market.

Instead of using coal as the basic raw material, they decided to begin with natural gas. Methods were available by which natural gas could be reacted with steam to produce hydrogen and carbon monoxide; but these methods were expensive, so they turned to oxygen. By partially burning natural gas, which is largely methane, with oxygen they could produce a mixture of hydrogen and carbon monoxide, which could be reacted over a catalyst to yield primarily high quality gasoline.

Cheap oxygen was as vital to the projected process as it is to the human body. It is ironic that oxygen, comprising half the volume of the earth, should be expensive. But in air, the most common source of oxygen, it is mixed with nitrogen, and the two elements are as difficult to separate as Siamese twins.

Until World War II, few American scientists had devoted much time and thought to making oxygen in large quantity and at low cost. It just wasn't in demand. Engineers of Hydrocarbon Research, Inc., have succeeded not only in designing an oxygen plant larger than any other in the world, but, by carefully integrating its operation with that of a Hydrocol plant, it will be able to produce oxygen for use in the



OXYGEN in huge quantities will be made at low cost by Carthage Hydrocol. Starting at left, air is whirled at tremendous speed in turbo-compressor. During compression, air temperature rises to 365 degrees F., at which point air is

cooled. Then air is expanded, causing its temperature to drop to -275 degrees F. and the air itself to liquefy. Liquid air is next piped to fractionating tower where oxygen and nitrogen can be separated by fractional distillation

Hydrocol process at a fraction of its former cost.

With the problem of oxygen production solved, it became necessary to learn how to control the burning of natural gas with oxygen. Before the development of the Hydrocol process, no one had succeeded in satisfactorily burning natural gas with oxygen at the pressures desired in the succeeding synthesis step. The problem appeared insurmountable. But after prolonged experimentation and research both on the part of Hydrocarbon Research, Inc., at its pilot unit at Olean, New York, and on the part of The Texas Company at its pilot unit at Montebello, California, the answer was found and a generator was devised in which the reaction would take place at pressures never before employed commercially.

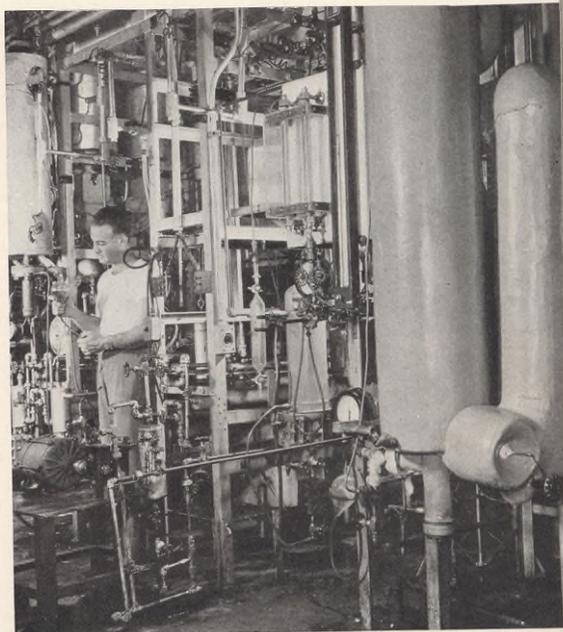
Next it became necessary to learn how to control the tremendous heat evolved when hydrogen and carbon monoxide react. This heat is almost as great as that evolved when the natural gas is burned with oxygen to produce carbon monoxide and hydrogen.

This problem was solved by employing an iron catalyst in the form of a very fine powder suspended in the reactor by up-flowing charge gas. A catalyst, to a chemical reaction, has much the same function as a referee in a boxing match. It brings the participants together and regulates their actions, and regardless of the intensity of the action and the effect on the participants, the catalyst usually emerges unchanged. In this instance, the catalyst does double duty by absorbing much of the heat of reaction and transferring it to water pipes imbedded in the reactor walls. Thus, not only is the heat of reaction removed efficiently—it is also put to work in generating power. Each cubic foot of methane charged to the process produces gasoline, Diesel oil, alcohols, high pressure steam, or some other valuable chemical product.

Carthage Hydrocol's plant near Brownsville will be deceptively small, considering that it will utilize some 230,000,000 cubic feet of air and 90,000,000 cubic feet of natural gas every day.

Oxygen, at the rate of 53,000,000 cubic feet a day, will be produced from the air and introduced at high pressure into the synthesis gas generator. At the same time the other chief ingredient, methane, will also be introduced into the generator, where it will be partially oxidized. It will be in the generator that the actual operation of the Hydrocol process will begin. The complete process is outlined on Page 5.

When the plant swings into full production, the operation will be smooth and continuous. Natural gas and air will come in at one end—finished products will go out the other. Yet, despite the revolutionary results obtained by the Hydrocol process,



Data obtained in pilot plant operation at Beacon Laboratories have been useful in designing Brownsville plant

the new plant itself will be anything but revolutionary in appearance. To the mind unschooled in oil technology it will apparently be just another refinery, characterized by a maze of pipes, valves, tubing, towering columns, and tanks.

Carthage Hydrocol is a symbol of the new age in oil. The significance of the Brownsville plant cannot be judged merely by its production rate. After all, the petroleum products it is to manufacture will constitute but a small part of the nation's total output.

The real significance of Carthage Hydrocol is that it is a basic advance in petroleum technology—another chapter in the saga of synthetic production. What chemists and engineers learn at Brownsville will influence developments in the commercial production of petroleum products from coal, shale, and other carboniferous substances.

The entire oil economy of the world will eventually be affected by the results of Carthage Hydrocol. It is perhaps well that, before the supply of crude oil dwindles too low, the synthetic petroleum industry, drawing on trillions of cubic feet of natural gas and billions of tons of coal and shale, can attain its full stature. The Texas Company is proud of its participation in, and contribution to, this important development.



This experimental Navy jet plane has pierced the transonic zone as it streaks low over California desertland

**H**ISTORY has the habit of imitating itself—and, in the continuing research “partnership” of oil scientists and aircraft engine designers, the habit has been a profitable one. From this long-standing informal research coöperation have come many innovations and improvements which have contributed much to the dramatic progress of American aviation.

And now, once again the airman and the oil man are repeating the history of past coöperative endeavor, in a new and exciting field—supersonic flight. New engines, new fuels and lubricants, and new aircraft are the order of the day. Headlines announce the latest progress in jet and rocket propulsion and hint at spectacular aerial feats to come. Almost daily, man moves—or *hurtles*—forward in his assault on time.

At the moment, faster-than-sound flight is in its horse-and-buggy stage. The aerodynamics of supersonic flight, the best types of fuels needed, the design of reaction-type engines—these problems are being subjected to thorough research. Out of this research will come the knowledge which will be the cornerstone of America’s future progress in the air.

Design of jet and rocket engines and the research and manufacture of their fuels and lubricants are now at about the same stage of development. Dr. Wayne E. Kuhn, Manager of Texaco’s Technical and Research Division, has announced that the Company is constructing what is believed to be the first privately-financed jet fuels and lubricants laboratory. The Texas Company will thus be prepared to contribute more than ever to the progress of American aviation. Texaco jet research augurs well for American flight.

Construction of the Texaco jet fuels and lubricants laboratory at Beacon, New York, will be part of the general expansion of the Company’s main research center, the Beacon Laboratories (see *THE TEXACO STAR*, Spring, 1947).

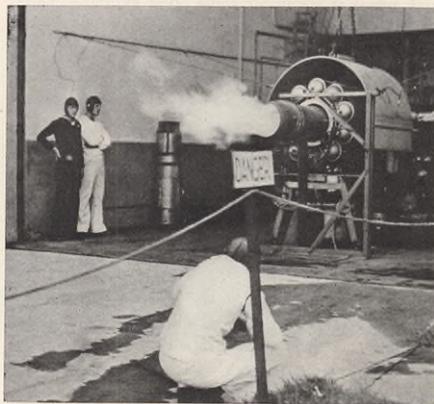
# JET PROPULSION

Texaco expands its research in  
this rapidly developing field

Dr. Kuhn has described the projected laboratory as probably “the most versatile of its type.” He announced that the plant would simulate “atmospheric conditions up to 60,000 feet altitude,” and that the wind tunnel would produce speeds up to 2,400 miles an hour. These facilities will provide for combustion research on fuels for turbo-jet and ram jet engines.

The new frontier of flight is a mysterious area of speed called the *transonic zone* (about 600 to 900 miles an hour). Flight utilizing jet and rocket propulsion is bringing a new vocabulary into use: *subsonic*, *transonic*, *supersonic*. All have a common reference—the speed of sound, which is 760.5 miles an hour at sea level.

A gremlin called *compressibility* haunts the transonic zone and literally knocks aircraft right out of the sky. Any youngster who ever thrilled at the awesome noise of a plane in a power dive knows that he



Hot exhaust gases stream from the inferno-like combustion chamber in this jet propulsion unit undergoing naval tests

can hear the thunderous vibrato well ahead of the plane. Now, somewhere in the transonic zone, an airplane exceeds the speed of the sound of its own flight, thereby critically disturbing the flow of the air mass in which it is flying. Then, trouble. No one knows exactly why.

Such aerodynamic spooks are the problem of the aircraft designer. His co-workers, the engine designer and the fuels expert, face equally grave problems. For example, the next time you have trouble lighting a cigarette in a high wind, stop and imagine the problem of trying to keep a fire lit in a ram jet engine at, say, a thousand miles an hour. That's one of the many

tough nuts of supersonic flight that Texaco research men hope to crack at the Beacon jet lab.

The aircraft engines now in common use are called "reciprocal internal combustion engines." Jet and rocket engines are called "reaction engines," and you'll be hearing a lot about them from now on. One other important distinction: jet and rocket propulsion are different. Jets take oxygen out of the air in which they fly to burn their fuel. Rockets carry oxygen right in their fuel.

The Texaco laboratory will do development work in fuels for both—each type of engine demands highly specialized Texaco products.

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## Texaco Grant Aids Atomic Research

**B**ASIC ATOMIC RESEARCH, which may eventually shed new light on present-day scientific problems, has been given added impetus by a grant of \$250,000 by The Texas Company to the Massachusetts Institute of Technology. The details of the grant have been made public in an announcement made jointly by Dr. Karl T. Compton, president of M. I. T., and Col. Harry T. Klein, President of The Texas Company.

This grant, the largest of its kind made by the Company to date, is an extension of the pre-war policy of promoting research among universities the length and breadth of the land.

The funds will be used for long-range "pure" research in nuclear fission and related basic studies on the ultimate nature of matter and energy, to construct high-voltage equipment of advanced design, and to train scientists in nuclear theory and its application.

This work will be carried on primarily in the M. I. T. laboratory for nuclear science and engineering. A maximum interchange of information will be sought by coordinating the nuclear "lab" work with the institute's departments of physics, chemistry, metallurgy, biology, and chemical, electrical, and mechanical engineering.

Emphasizing the importance of nuclear research, Dr. Compton said: "In this far-reaching investigation of nuclear processes we will cross scientific frontiers into new territories, of which only a small part has been explored. The discovery of that particle of matter, the electron, led to the creation of the great industry of radio and allied methods of communication. There is every reason to believe that equally exciting and important discoveries will come from

a better understanding of the structure of matter.

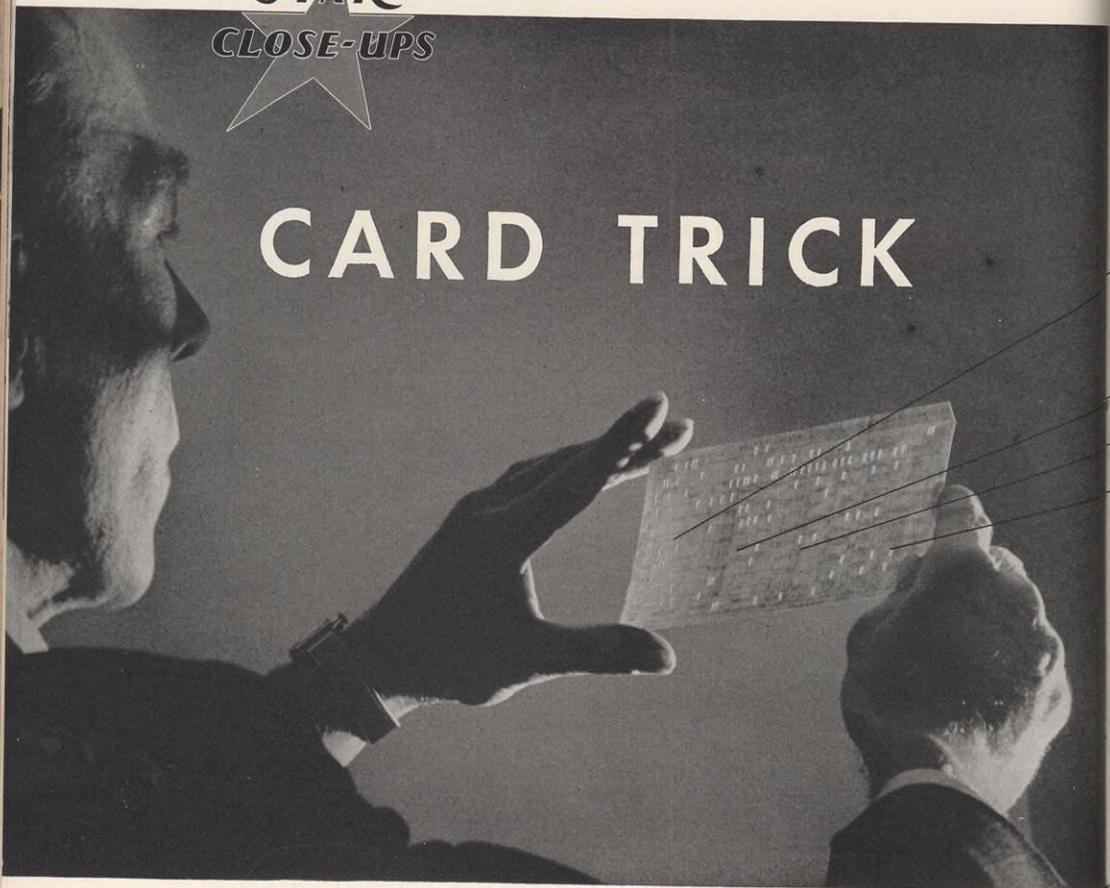
"This grant is an outstanding example of the ever-widening range of industrial interest in the advancement of fundamental knowledge. It constitutes an enlightened form of investment in progress, contributing to the development of new processes and products and to the education of young scientists and engineers."

Explaining the interest of The Texas Company in nuclear research, Col. Klein said: "It is the hope of The Texas Company that this grant will help science usher in a new era of technological progress through a greater knowledge of the atom. Since industry must eventually pass on to humanity the benefits of this work, it is to its own interest, as well as mankind's, that it take the lead in making basic research possible."

The dollar-for-dollar soundness of such grants to colleges and universities has been clearly demonstrated by the encouraging results that have come from campus laboratories. The majority of basic research projects, of course, are concerned with laying the groundwork for future practical investigations. An example of the latter type of research are the experiments in chemistry and chemical engineering which now indicate future significant reductions in the costs of discovering, producing, and refining oil.

As basic studies evolve, the greater understanding of physical and chemical phenomena will bring practical benefits to all, not only in matters of industrial equipment and processes, but also in terms of our everyday needs. By assuming a leading rôle in sponsoring atomic research, Texaco is underwriting a more productive future for society.

# CARD TRICK



**A**T A COMMITTEE MEETING in New York a short time ago, before deciding the plan of action to be followed, it was necessary to assemble some voluminous and comprehensive data.

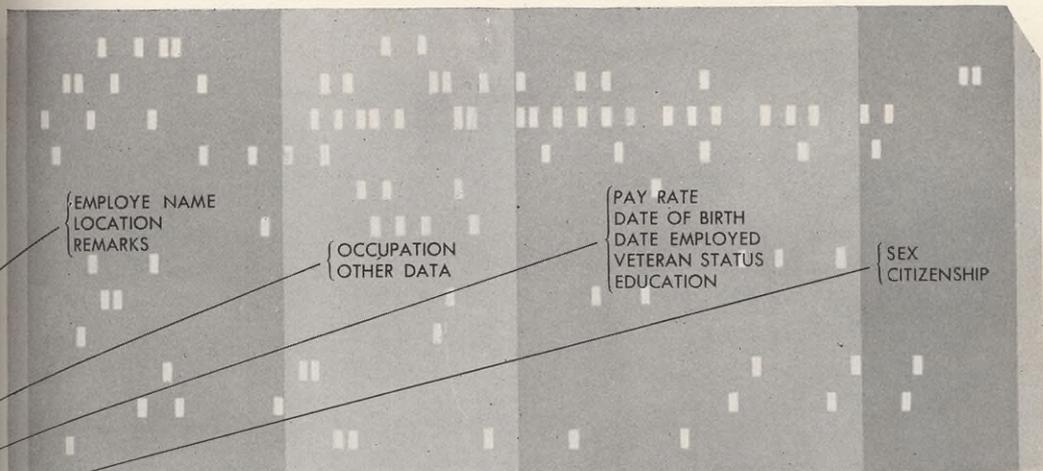
"It'll take weeks to get that information together," one committee member said, "and, unfortunately, time is of the essence."

Oscar Lasse, Manager of the Personnel Department, was consulted. "With the facilities we now have," he said, "we can shorten that time considerably." The committee adjourned with the assurance that the information desired would be obtained and available for presentation to President Harry T. Klein within the short time allowed.

Mr. Lasse returned to his department and explained to his staff the importance of assembling the requested data as speedily as possible. The wheels were set in motion immediately, and by the next morning the entire job was completed and on Col. Klein's desk.

What made it possible for the Personnel Department to do this is illustrated on this and the following pages. Here is the way it was done:

In the department's tabulating room, a selected batch of perforated, oblong cards (similar to the one shown above) was fed to an electric tabulator. Gobbling up 80 cards a minute, the tabulator assimilated the desired information hidden in the cards' perplex-



"It's in the cards"—of the Personnel Department. Holes (above) that form an intricate pattern are codes for "vital statistics." This is actual size of tabulating card

ing pattern of holes. Then, with a rhythmic clicking of type, the machine pounded out printed statistics on a wide paper roll. The final report was prepared with the aid of other—and equally amazing—electric machinery.

Fundamentally, the tabulating system consists of recording data by punching holes, according to a definite pattern or code, in a specially designed card—and then using the cards in other machinery that transforms the holes into letters and numerals. There is a spiritual kinship between a tabulator and an old-fashioned player piano.

Each piece of apparatus is a highly technical electrical instrument. Outward appearances belie the maze of minute and complicated electrical circuits under the metal skin of these "mechanical minds."

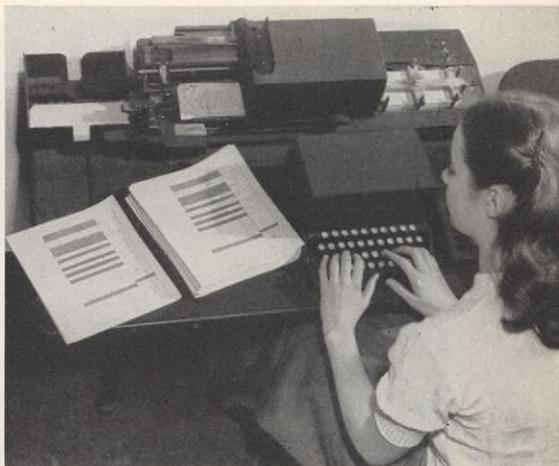
Personnel's "card trick" begins with a keypunch machine operator cutting a personnel record card when an employe is hired. The operator uses, as information, a data sheet prepared by the Record Group of the Personnel Department.

To make a change (as in occupation, location, or the like), the employe's card is taken from the file, and the keypunch operator taps out, on a new card, only the change and date on which the change becomes effective. When a group of changes is finished, the two sets of cards ("old" cards containing complete data and "new" cards containing only changes) are fed to a reproducing machine. In this device, unchanged information is automatically picked up from the old cards and punched in the new cards.

Sorting is done by another special machine with mechanical fingers that shuffle a stack of cards and then deal out the cards in new stacks in any desired classification.

A large and progressive corporation with thousands of employes, such as The Texas Company, finds it pays to have a comprehensive record of "vital statistics" about each employe. Texaco uses the method

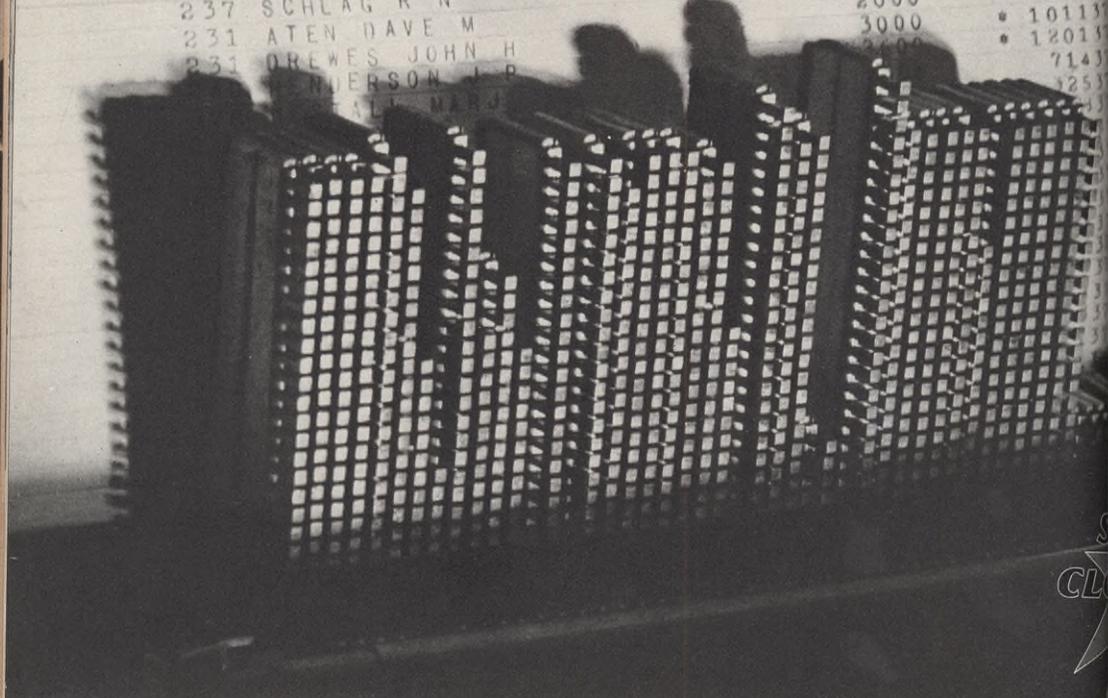
*(Please turn to Page 13)*



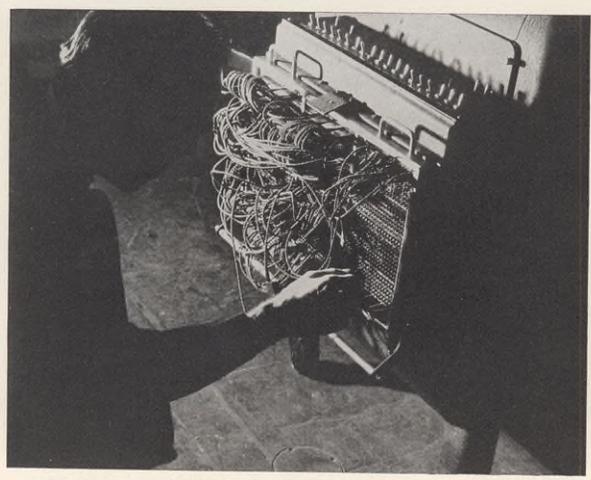
Tapping keys stimulates mechanical "brain" of this machine and puts it to work punching codes in record cards

174 BOLES  
 174 PAGE GEORGE R J  
 229 HARMON R M  
 231 MC GREGOR HUGH  
 231 WUNDER MICHAEL  
 237 BLACKBURN W B  
 237 SCHLAG R N  
 231 ATEN DAVE M  
 231 BREWES JOHN H  
 231 JERSON J R

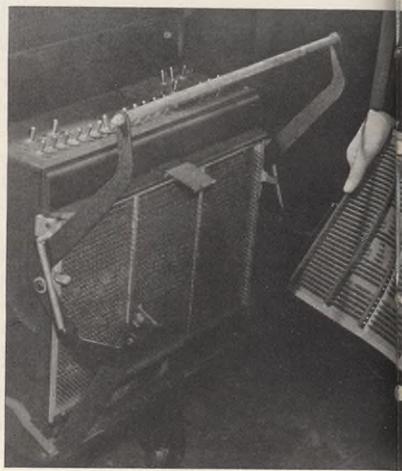
3600 \* 70637  
 5700 \* 51037  
 7907 10737  
 9250 \* 101337  
 4700 \* 51337  
 2000 \* 20137  
 3000 \* 101137  
 7143 \* 120137  
 12537



Caught by the camera at the moment of printing, this line of tabulator type resembles a row of skyscrapers. The holes in the personnel record card become listings on paper rolls



"Nervous system" of the tabulator is this intricate wiring board, a maze of cords for interconnecting electric circuits



Removable wiring boards give the tabulator flexibility. Boards can be pre-set for reports and easily interchanged

**THE TEXACO STAR**



By connecting reproducer (right) to tabulator, the reproducer cuts a "total" card when tabulation is completed

## CARD TRICK

(Continued from Page 11)

pictured here to assure utmost speed, economy, and precision in dealing with the increasing requirement for essential facts.

Of course, electric accounting machines are not recent innovations in business. Texaco, however, does lay claim to having been a pioneer, back in 1935, in using this means of keeping personnel

records. Today, from its files of several hundred thousand record cards, the Personnel Department can compile more than 100, different kinds of tabulations.

By keeping the record cards up to date at all times, the Personnel Department can readily do one of its card tricks whenever called upon. If it's "in the cards," the Personnel Department can produce the information.

STAR  
CLOSE-UPS



ulator flexibility.  
asily interchanged



Often, only part of the personnel record cards in the Personnel Department are tabulated. The sorter (above) mechanically shuffles cards into any desired classification



The culprit was a mechanical failure

TAKE A GOOD LOOK at the picture at the left. Puzzling? It's a transparent plastic model of an aircraft-type piston. The three finger-like projections? They're piston rings attached, for experimental purposes, to the cylinder wall so pressure of piston rings rubbing on the cylinder wall could be simulated by pushing up the cylinder wall section. The dark curlicues? Polarized light shot through the model to prove that improper lubrication was not the cause of the piston shearing off above the upper piston ring. (Look at the right end of the topmost "ring" and let your eye travel diagonally up to the right 'til it comes to the valley-like top of the piston. You've just traced the line where the piston was shearing.)

Texaco's Beacon Laboratories were presented with the problem of overcoming ring sticking. Texaco experts thought they knew the reason, so they built this plastic model to prove they were right.

Those curlicues are "interference lines" revealed by polarized light rays. They show the points of greatest stress. The greatest stress comes at the structurally weakest point of the piston, along that diagonal you just traced with your eye. Polarized light on the subject revealed the true culprit was not lubrication. A mechanical failure was causing the trouble.

## THROWING LIGHT ON THE SUBJECT



Not Picasso

TO PARAPHRASE Fred Allen, "It isn't Picasso, kiddies." And lest you think that the front cover of this issue of THE TEXACO STAR is straight off the French modern master's easel, be assured it is simply a couple of gears showing their teeth. Texaco's Beacon Laboratories experts have dressed them up in a gorgeous array of go-to-meetin' color

for purposes of research. They want to find out how gears behave when they're meshing with one another, and what characteristics lubricants need when working under extreme pressure.

It's really quite a problem. For example, you'd never suspect from the prim symmetry of a neighborly gear that it might be suffering from all manner of internal stresses and strains. Well, it often is—right down to its roots, in fact. A gear, of course,

isn't a very revealing soul, so when Texaco's research men wanted to study ways and means of helping gears to get along with one another, they turned some gears inside out, so to speak. They built transparent plastic models of gears and took a picture of them in action. The glamorous color comes from polarized light, which was directed through the models while they were simulating actual working conditions.

Well, the polarized light did the inside-out trick. It really revealed the private life of a gear. At least, it revealed it to the experts. The small black-and-white reproduction at the left may help you get the lowdown on gears. The flat grey running like an aimless river through the center (it's a sizzling red on the cover) is the space between the gear teeth.

There are two teeth at the right, two at the left. If you look closely, you'll notice round "corners" at the roots of the teeth at the left and square corners at the gear tooth roots at the right. The bright whorls of color show strain. The square corners show more strain than the round corners.

# Unbelievable Opera

By GEORGE E. SOKOLSKY

EDITOR'S NOTE: "Unbelievable Opera" originally appeared in Mr. Sokolsky's column, "These Days," in *The Sun* (New York), and was syndicated by King Features Syndicate, Inc. It is reprinted by permission.

The Saturday afternoon broadcast, March 13, marked the conclusion of the eighth successive season that the Metropolitan Opera broadcasts have been sponsored by The Texas Company. Listeners the world over tune in these broadcasts. In all, during the season, it is estimated that the programs reach some 10,000,000 listeners. According to the magazine *Sponsor*, the effect of Texaco's sponsorship of the opera broadcasts is felt all year 'round. "One truck fleet owner whose gasoline purchases run into millions of gallons a year admitted he had shifted to Texaco because his wife said that any company who sponsored such a fine program must produce a good gasoline—and after all he 'wanted to keep peace in the family,'" it says in a recent issue.

NO ONE would have thought it possible 10 years ago or even five, but grand opera, as they used to call it, actually has been made to pay. The Metropolitan Opera House, which used to be supported by the Diamond Horseshoe of the super-rich and always lived in poverty, is now actually a business proposition that makes its way without begging to cover deficits. The profit is small, only about \$12,000 for 1946-47, and were this a profit-making business that had to pay taxes, there would have been a deficit. Fortunately, common sense recognizes opera as a public service.

In the old days, the dowagers and their parties used to attend, or buy boxes and not attend, because it was one of those things that was done. A few music-lovers could be found among the dowagers but most of them were more concerned with being seen than listening, and as long as opera catered to them, it was undoubtedly in many respects vulgar. Nowadays, so little attention is paid to such notabilities that recently, to attract the photographers, one of them, a woman, smoked a cigar, which is no worse than the penchant another had for standing on his head.

The main body of opera-goers is not of this ilk. They go because they love that kind of music. Fewer barbers are about to earn an honest dollar as a clique. Among the standees are more young people, boys and girls, students by their careless clothes. In the intermissions, they speak with the meticulous

jargon of those who have read many books and listened to more recordings.

The radio has done much for opera, although last year it brought only \$166,000 in cash. Thousands listen to the opera on Saturday afternoons on the radio and enjoy the opera quiz and Professor Goldovsky's extraordinary capacity for making the obscure clear even to the uninitiated. There are enough who prefer opera to football, who had rather listen to Jan Peerce and Ezio Pinza than to the shriek and shout of some radio announcer. Those who listen on the radio develop a yearning for reality and when they get a chance they go to the Metropolitan or take it in on tour. In fact, the tours have helped to earn the little profit, bringing in \$770,000 last year.

Opera is a musical adventure that does not appeal to everybody. My friend, Westbrook Pegler, abominates it. On the other hand, no finer melodrama has been written than *La Gioconda* and no tear-jerker superior to *Madame Butterfly*.

Be that as it may, the startling fact about the Metropolitan is its Americanization. An increasingly large number of its staff is native. Edward Johnson, who manages the enterprise, had to call himself by an Italian name when he first tried to make the grade. That is no longer necessary. Auditions are held for American young men and women and an astonishing number make the grade. In fact, some of them are now Metropolitan stars. They are young and not a one of them is a Caruso or a Patti or a Schumann-Heink, but they are worthy of the high traditions of the Metropolitan.

And that, in a measure, must explain the popularity of the Metropolitan and of Tanglewood and of so much good music on the radio and the constant increase in the sale of important recordings. The younger generations of this country have become more music conscious and are not longer satisfied with the artificialities of crooning and the roar of jazz and the meaningless riot of swing. They seek real music.

I personally, as an utter and complete amateur, do not go much by what the critics say. I go to listen. I am always thankful that opera and the symphony are available to give me the richness of sound and color and that sense of being wafted into eternity.

# SPEED PAYS DIVIDENDS

By H. A. MURRAY

Technical and Research Division, The Texas Company

**Air travelers and airline operators will both benefit when the new Stratocruisers begin commercial flights in a few months**

**B**EGINNING THIS SUMMER, many air travelers to distant cities around the globe will reach their destinations sooner than ever before. Speed will give the traveler a bonus reckoned by the clock; it will pay off for airline operators in lower operating costs.

This double boon on the airways will be the Stratocruiser, which will be making commercial flights in a few months. Product of Boeing Aircraft Company, and lubricated throughout by Texaco, the giant new craft will be the largest, fastest, and most luxurious of all post-war airliners.

Progress in the development of commercial transport planes is well illustrated by the story of the Stratocruiser. Over the years, the story has gradually evolved through better aerodynamic designs, improved engines, and better fuels and lubricants.

Back in 1916, a group of resourceful men under the leadership of William E. Boeing started an "airplane shop" in Seattle, Washington. During the 11

years which followed, four successful models of trainers and fighters were developed by Boeing and adopted by our infant Air Corps. These were the first in a long line of successful military aircraft. The Boeing Flying Fortress (B-17) and the Superfortress (B-29) became, for many, the personification of this country's aerial might during World War II. The story of the commercial aircraft Boeing has developed is not so well known.

In 1927, the Model 40-A was designed as a combination mail and passenger plane when Boeing Air Transport Company was awarded a contract for an air-mail route from Chicago to San Francisco. The route was later extended from coast to coast. The 40-A carried two passengers plus mail at 105 miles an hour. Passengers paid \$400 for a hardy 32-hour coast-to-coast trip.

The 30-A, a tri-motored biplane with accommodations for 12 to 13 passengers and a cruising speed of 125 miles an hour, came a year later. Speed, people said, was the airplane's greatest asset. Boeing's efforts were directed along the lines of cutting down drag, increasing speed, and reducing maintenance costs. Externally braced biplane wings and exposed landing gear made a slow airplane. Furthermore, fabric-covered wings and fuselage were expensive to maintain.

It took a lot of imagination and courage to break away from tradition and take such a bold step as designing an all-metal, full cantilever monoplane with retractable landing gear. In 1930, the Monomail (a mail and passenger plane) exemplified Boeing engineers' efforts to accomplish these objectives.

Greater emphasis on safety and reliability for passenger service inspired the Model 247, in 1933. This ship, like the Monomail, was of all-metal construction, accommodated 10 passengers, and cruised at 180 miles an hour (faster than the pursuit planes in the Air Corps). The transcontinental fare came down to \$160.

Later in the 1930's, when larger engines became available, larger transports appeared to be practical and economical. The Stratoliner (1940) had accommodations for 33 passengers. It was the first plane



A spacious control cabin makes flying the Stratocruiser easier. Texaco lubricants, used throughout, do likewise



with a pressurized cabin and proved the advantages of over-weather flying at high altitudes.

These ancestors of the Stratocruiser are pictured at the right. The Stratocruiser will accommodate from 60 to 114 passengers and up to 8,000 pounds of cargo in its double-deck fuselage. It cruises at 340 miles an hour (top speeds are reported to exceed 400 miles an hour), has an operating range of 4,200 miles, and is designed to fly at 25,000 feet, with a ceiling of 30,000 feet, the highest altitude for any commercial transport plane in service. At the same time, the estimated operating cost (including overhead) is lower than any other commercial transport plane.

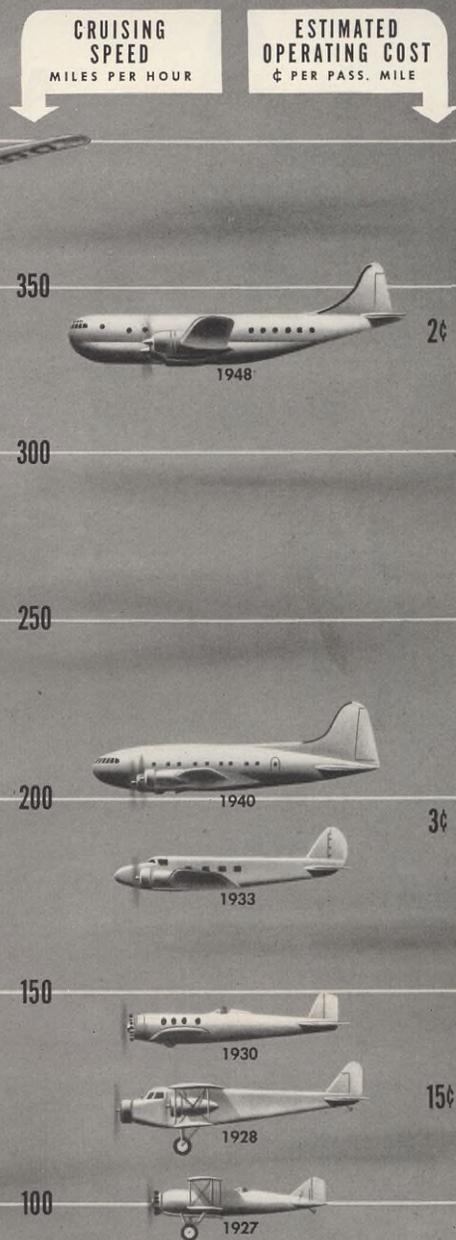
Aerodynamics and engine design play important parts in the Stratocruiser's high speed, greater payload, longer range, and lower operating costs. Likewise, petroleum technology has contributed to the plane's development.

Aviation fuel research has aided in obtaining high performance and low fuel consumption in the plane's four 3,500 horsepower Pratt & Whitney 28-cylinder Wasp Major engines. The new ship will be the first commercial transport to use the new super fuel (known as grade 115/145) recently developed for combat aircraft. Texaco helped create this new super fuel, which has distinct advantages over the wartime 100-octane aviation gasoline (100/130 grade).

Because of The Texas Company's active part in developing aircraft lubricants, Boeing called upon Texaco engineers to advise on types of lubricants for the Stratocruiser and, subsequently, lubricated the first ship exclusively with Texaco products.

The extremely wide temperature ranges of the Texaco lubricants used in the Stratocruiser make it possible to lubricate the plane with approximately the same number of oils and greases required by the average automobile.

Research in aerodynamics, structures, engines, fuels, and lubricants all adds up to faster, as well as more comfortable and cheaper, air transportation. This Summer, the world will shrink a little as speed pays a dividend.



The race against time has brought significant results at each step of the way, as the above chart (tracing the development of the Boeing Stratocruiser) shows. Most important, perhaps, has been the continuous reduction of operating costs per passenger mile. During the coming Summer, the mammoth new Stratocruiser (top) will be ferrying passengers around the world. It will be the largest and fastest commercial transport airplane in operation



More than 3,500 persons attended the Texaco distributor-sponsored meeting

# ADAMS COUNTY GET-TOGETHER

**APPLE ORCHARDISTS** in Adams County, Pennsylvania, believe they grow the finest apples in the world. When the Citizens Oil Company, distributors of Texaco products in Adams County, recently staged the farm show in Gettysburg pictured on these pages, there was plenty of competition for the first prize for the best exhibit of apples (a plate of six York Imperials took the highest award). Keen interest was also shown as Adams County farmers carefully inspected the many other exhibits of local produce, farm supplies, and equipment.

Nature has beautifully blessed Adams County (grain, cherries, peaches, tomatoes, and dairy cattle thrive on the land), and farmers there believe in using modern machine methods to make the most of this endowment. More than 25 per cent of the petroleum products consumed by the heavily mechanized farms and by other users in the county comes from Citizens Oil.

To celebrate the 30th anniversary of the business which was founded by the late William F. Codori and is presently under the leadership of Joseph E. Codori, his eldest son, Citizens Oil Company sponsored (in January) Adams County's first farm meeting since 1941.

It was a huge success. Attendance for three night and one afternoon sessions totaled more than 3,500 men, women, and children. Each session was a "family party" in spirit. Exhibits of candy, cookies, cakes, pies, eggs, vegetables, preserves, apples, quilts, and other hand work lent a county fair atmosphere to the midtown meeting place.

In line with The Texas Company's policy of helping distributors and consignees conduct farm meetings, Texaco's Sales Department worked closely with Citizens Oil in putting on the show. The program was both entertaining and instructive. Sound motion pictures, including some of Texaco's newest farm films in full color, were shown at each session. Climaxing the celebration was the presentation of a gold wrist watch to Mr. Codori by The Texas Company in appreciation of three decades of business association with Citizens Oil Company.



Citizens Oil Company's 30-year service award is accepted by J. E. Codori (left)

Entire families came to the "party." Sandman was active among infants



One of first-prize "York Imperials" receives close scrutiny of this couple who enjoyed exhibits and, later, show



Some of the exhibition quilts appear behind this Texaco display





Final evening session of farm show sponsored by Citizens Oil Company, Texaco distributor in Adams County, Pa., comes to a close with everyone singing *God Bless America*

Before show starts, R. S. Codori (left) does some selling



Frosting on enticing exhibit of home-made cake makes one visitor forget she isn't in mommy's kitchen



Copy of *Harvest Gold*, Texaco's farm manual, is handed to a guest by Mrs. J. A. Codori



*Here is the story of Junior Achievement. It is told as you might tell it to a friend, a neighbor, or a fellow worker. The following incident is fictitious, but the facts it encloses are encouragingly true.*



"We can sort of watch the market and change our line if necessary." The president of Texaco-sponsored Junior Achievement Enterprises works on a special order

## THEY'RE LEARNING BY DOING

**FUNNY** THING happened at our house the other night. It was right after dinner. I was looking out the parlor window and I saw one of the youngsters in the neighborhood coming up the walk. He was carrying something in his hand.

When I went to the door he seemed a little timid, and yet he had an awfully determined thrust to his young jaw.

"Mr. Johnson," the young man said, "I'd like you to see this tie holder and ring holder which my company makes. I'm chairman of the board and the company is called Junior Achievement Enterprises. It's a very good product and our sponsor is The Texas Company and we learn all about different phases of business. . . ."

Well, I was just about floored by this flow of words and I said:

"Hold on, young fellow—just a minute. C'mon in and let's talk this thing over."

We went into the parlor and sat down.

"Maybe we'd better start at the beginning," I said. "What's your name?"

"Gee, I thought I told you, Mr. Johnson. My name is Bill Riegels. We live down the street."

You'd have gotten a kick out of him. He was terribly in earnest.

"Tell me, Bill," I asked, "just what is this company of yours? How did it get started? And what has The Texas Company got to do with it?"

"It's like this, Mr. Johnson," he said, "last Fall, when we went back to high school, a fellow came and talked to us at assembly. He was from the national

headquarters of Junior Achievement, Incorporated, right here in New York. He told us we could join J.A. and start our own companies and learn all about business and the problems of managing a company, and producing, and selling. . . ."

Bill was in high gear but I didn't want him to get away from me. His enthusiasm was honestly delightful. I asked him if he had to pay to get in Junior Achievement.

"Oh, no," he answered. "We just filled out a card and one day I got a card to come to a meeting. I took the subway into Manhattan. There were a lot of kids there from all over the New York area. We were assigned to groups. There are seven fellows in my company. There were three men there from The Texas Company. They are our advisers for administration, production, and sales."

Of course, I was interested in just how much the kids were doing on their own and how much the Texaco advisers were directing them.

Bill had some pretty firm opinions on this matter. "We make all our own decisions, Mr. Johnson. It's up to us all down the line. We named the company and decided what we would make. We sold stock to raise capital—had to buy some ourselves, too. We made arrangements to rent space at J.A. headquarters every Monday night for two hours, and we had to decide how much salary to pay ourselves. . . ."

That really aroused my curiosity.

"Tell me, Bill, how much do you pay yourself?"

"Right now," he said, "we've got it figured out

from our profits that we can pay ourselves a nickel an hour and still pay a fair dividend and meet all our bills."

Just about then my wife walked into the parlor. I introduced her to Bill.

"This young man," I told my wife, "is quite a business man . . . and he knows what he's talking about. He's selling for a company. . . ."

"Oh, not exactly, Mr. Johnson. Excuse me, sir, but I'm chairman of the board. You see, one of the first things we did last Fall was to elect our officers. I guess I'd better tell Mrs. Johnson that the name of our company is Junior Achievement Enterprises. That doesn't tie us down to any product. We can sort of watch the market and change our line if necessary and still keep our name. . . ."

My wife was plainly taken in by young Bill. He had found a new recruit and he went to work.

"We make a very nice wooden tie holder. I think Mr. Johnson would like it. Here it is . . . and here's a nice article for you, a plastic ring holder which we based on an expensive Chinese design."

During the next few minutes Bill sold my wife the two articles, pocketed the money, and settled back with a satisfied and confident sigh.

My wife brought in some cake and milk for Bill, and we had coffee. There was one chairman-of-the-board, let me tell you, who hadn't worried himself into stomach trouble. Not with that appetite!

We learned from Bill that Junior Achievement, as a national organization, is already 22 years old. It started in Springfield, Massachusetts. About six years ago headquarters moved to New York and the program really began to expand. J.A. now operates



"We make all our own decisions." Two of three Texaco advisers sit on sidelines during weekly business meeting

in more than 81 cities. It is supported by 3,400 business organizations. Some contribute funds, some sponsor J.A. companies by providing volunteer advisers, some do both. Texaco is an example of the last type.

What caught my fancy is the fact that every company is in reality a miniature corporation. There are absolutely no restrictions to membership except age. Fifteen to 20 is the age—mostly high school kids. All race, creed, and color discrimination is out. Bill was emphatic about that.

I had to laugh when he told us that they rented their machinery from J.A. because they couldn't afford to buy and "amortize" in such a short existence. The companies are organized at the beginning of the school year and liquidated at the end.

"We liquidate our assets, and pay an extra dividend from what we have left over," Bill told us.

It never occurred to him that the company might go under. Some do, we learned.

"We're on the right track, though," Bill said. "Last Fall we won the New York Metropolitan prize for having the best company in Junior Achievement during the organization period. We've got our market figured out, and we keep our costs in line. . . ."

Now, I don't want to sound philosophic, but as I listened to Bill I kept thinking: "This young chap knows what he's talking about. He's learning about American business methods the hard way—by doing. One thing is certain: he may not be another John D., but he'll never be sold a bill of goods against free enterprise."

When Bill left he thanked us and said:

"Maybe when we incorporate again next year I'll let you in on a few shares. It's good stock. Thanks for the sale . . . good night."

Darn good stock, I thought to myself, darn good.



"We've got our market figured, and we keep costs in line."

Sales and production managers discuss new product



Today's yard goods departments are wonderlands of colorful fabrics for milady

## SPINNING BETTER YARNS



Texaco products keep these spindles humming and help produce well-conditioned fibres. Texaco paces textile progress

**ABOUT ALL** a soldier needed for a uniform in Julius Caesar's time was a sleeveless tunic (a little *above* the knee) and a pair of sandals. Total weight: three and one-half pounds. Contrast this with the requirements of a modern paratrooper: 19 pounds of wool (including blanket), 17 pounds of cotton, and a parachute made from 70 yards of nylon.

As great as the latter figure may seem by comparison, even greater is the amount of cotton, wool, rayon, silk, and nylon purchased in a thousand forms from dresses to drapes by average American families every year.

The fabric is available because the machine age made possible mass production at low cost. And the machines—looms, spindles, spinners, carders, and winders—operate at peak tempos because the way is smoothed for them with industrial lubricants tailored for the job.

Petroleum lubricants began to replace whale and vegetable oils in textile mills in the 1850's for the simplest of reasons—they were cheaper. Later, mill owners realized that they were also more versatile and efficient. Soon, the mill owners were demanding lubricants that would withstand light, heat, oxida-



It isn't a torture chamber, although in 1830 the business of spinning and weaving must have seemed torturous to the men and women who operated the crude machinery for long hours by hand

tion, and evaporation; act as a shock-absorber between metal parts without gumming-up, and not splatter, creep, or drip. It was a big order.

But it was a big order petroleum chemists thought they could handle. They were sure that *preventive* lubrication could cut power costs (high because of friction losses) and make machines work better and last longer.

Texaco lubrication engineers, who took an early interest in textile lubrication problems, found that although the basic function of lubricants is to reduce friction, other properties could be added by chemical means and blending with other materials. So the engineers began experimenting with ways to improve the oxidation resistance and rust preventive qualities of the lubricants, and also their "stay-ability" (adhesiveness) and "pumpability."

It wasn't long before their work started to bear fruit. Not only were the lubricants themselves being constantly improved, but manufacturers began to design new textile machinery with these new lubricants in mind.

The oils and greases which are now applicable to a wide range of different textile machinery are the result

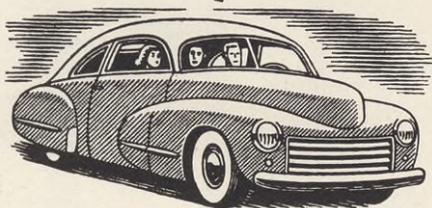
of the petroleum industry's research, over the years, to solve specific problems. In numerous instances, petroleum technologists have designed special lubricants to meet specific problems in lubricating the machines that make the almost infinite variety of fabrics available today. Texaco Spindura, for example, is an excellent lubricant for spindles. Another well-known product, Texaco Stazon, is specially designed for bearings in looms and top rolls. The name means what it says: that it will stay on the bearings and off the material—and prevent costly spoilage.

The emphasis in lubricating practice is coming more and more to bear on economies that can be effected by using the right kind of oil or grease for a given job. Power savings in a single bearing are usually negligible. But multiply that by the hundred-odd bearings in many types of frames, and the savings will certainly show up on the balance sheet at year's end.

Texaco scientists, like other lubrication specialists, know they can never completely lick the friction problem. But by constantly improving products and techniques they add to the ever-increasing ability of the textile industry to spin better yarns.



## Petroleum Promotes Progress



### Texaco "Green Thumb" Vets Start Freedom Gardens

MORE THAN 40 per cent of the food consumed in this country during World War II was grown in Victory Gardens. Employees of The Texas Company were among those Americans who cooperated enthusiastically in the program, which had a significant place in the nation's total war effort. Now, Texaco's "green thumb" veterans are being asked to swing into action again with seed and hoe.

Domestic food production is shouldered with the task of feeding a good part of the world and, in the opinion of Secretary of Agriculture Clinton P. Anderson and other food experts, the new gardening program, which calls for 20,000,000 Freedom Gardens, will aid greatly in the world struggle against hunger.

Col. Harry T. Klein, President of The Texas Company, has already sounded the call to action to Texaco's home gardeners.

### Products Now Moving Through Wyco Pipe Line

TEXACO'S EXPANSION, geared to the growing consumer demands for petroleum products, proceeds apace: early this year the Wyco Pipe Line Company,

an affiliate of The Texas Company, announced that the Wyco pipe line had been placed in operation. The line is an eight-inch products line which extends 267 miles from Casper, Wyoming, through Cheyenne, Wyoming, to Denver, Colorado.

First products to move through the line, which will assist in relieving the tight product distribution situation, were Diesel fuel and kerosine. Deliveries of Texaco products to customers of the Company's Denver Sales Division will be made from both Cheyenne and Denver.

### New Book Describes U. S. Oil Operations Abroad

FOR THE FIRST TIME, the importance and magnitude of the foreign operations of American oil companies is described comprehensively in a new book, *American Oil Operations Abroad*, by Leonard M. Fanning (McGraw-Hill Book Company, Inc., New York, \$5).

The book is timely and it spotlights with facts a little-understood and significant part of our economy. Fanning reveals important information about the large investments and the long periods of arduous work needed to find and develop foreign oil fields. His book is illustrated with more than 250 photographs, some of which show operations of foreign subsidiaries and affiliates of The Texas Company.

The author's careful documenting of the way American oil companies are bringing progress, higher standards of living, and Yankee know-how to lands around the world should help dispel a good deal of the misinformation which has obscured correct thinking on this important subject.



Our American neighbors in Brazil have ideas of their own about up-to-the-minute service stations. Witness this modern Texaco super-service station opened recently in the city of Campinas, Sao Paulo, by the Cia. Nacional do Comércio Bufarah S. A. It's the most complete service station-automobile agency in South America



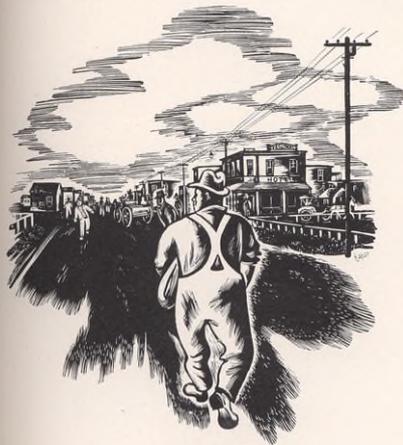
Downtown Port Arthur: A Texaco tanker passes en route from Texaco's refinery at Port Neches to the Company's Port Arthur Terminal. The North Tank Farm of Port Arthur Works is in the middle distance at left. Just glimpsed on horizon at right is Neches Butane Products Company, in which The Texas Company has a substantial interest

## GOLDEN JUBILEE

**T**IME began 50 years ago, in 1898, for Port Arthur, Texas. Five years before that, a sleepy little community called Aurora on the shore of Lake Sabine held only a handful of people. Port Arthur, named for its founder, Arthur E. Stilwell, contained 1,116 persons when it was incorporated. Now it is a city of nearly 50,000.

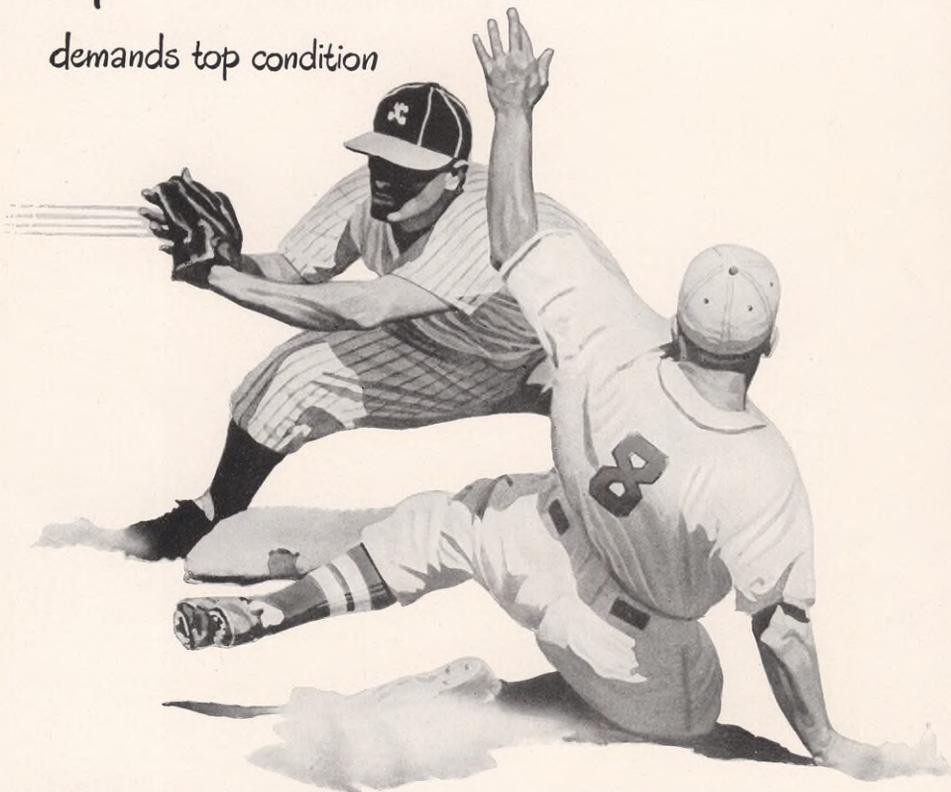
Stilwell's dream of its becoming a port came true within a few years. A railroad builder, Stilwell sought to construct a rail line to transport farm products of the Middle West to Lake Sabine, which would be a safe, landlocked harbor if a canal could be dug to link the Gulf of Mexico with the lake waters. Stilwell enlisted the support of John W. ("Bet a Million") Gates, and Port Arthur became not only a port, but an agricultural center and a pleasure resort and later a great industrial city. It is the site of The Texas Company's chief refinery, the oldest in the state of Texas.

On its Golden Jubilee, The Texas Company extends congratulations to Port Arthur, the city with which it grew up.



# Top Performance

demands top condition



It's time to see your Texaco Dealer  
for a Spring check-up ✓

- ✓ He will check your spark plugs, battery, tires. Drain and flush your radiator. Make complete under-car inspection.
- ✓ He will lubricate chassis with long-lasting MARFAK, the tough lubricant that gives you "cushiony" driving. He'll protect gears with proper Spring grade of Texaco transmission and differential lubricants.
- ✓ For more gas-miles, power, economy, he'll fill the crankcase with HAVOLINE, the modern motor oil. CLEANS as it lubricates.
- ✓ For power-to-spare, get Texaco SKY CHIEF gasoline...or FIRE-CHIEF, the motor fuel for utmost power at regular gasoline prices... sold by your Texaco Dealer, the best friend your car ever had.

**THE TEXAS COMPANY**  
**TEXACO DEALERS IN ALL 48 STATES**



**TUNE IN:** TEXACO STAR THEATER every Wednesday night featuring Gordon MacRae, Alan Young, Evelyn Knight.  
See newspaper for time and station.