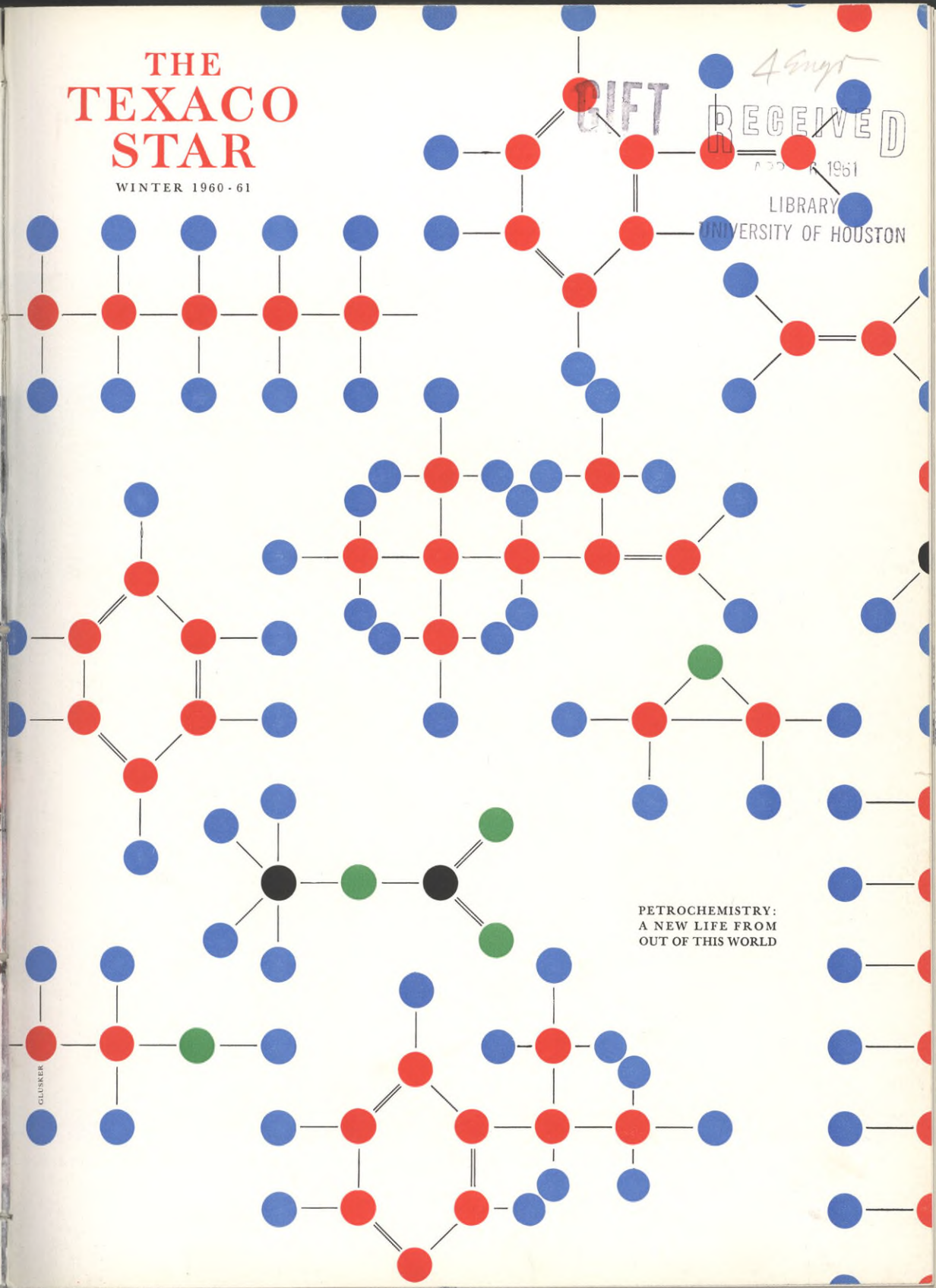
THE TEXACO STAR

WINTER 1960-61



PETROCHEMISTRY:
A NEW LIFE FROM
OUT OF THIS WORLD

GILLSKER

Tunneling through the timbered support for the highest lift at Stowe, Vermont, this skier is one of 3.5 million American

cans *who regularly travel hundreds of miles to enjoy the sport.*

THE TEXACO STAR

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THE COVER: To a chemist, this jumble of dots and lines makes perfect sense. He reads it as an arrangement of some of the molecular structures that have become commonplace in the fast-growing petrochemicals field. Shown here are the symbols for styrene, polyethylene, benzene, di-isobutylene, ethylene, ammonium nitrate, ethylene oxide, and cumene. All of them are important materials in the industry which has brought tremendous changes in our living over the last three decades. For a report on Texaco's interests in today's petrochemistry, see Page 5.

THE TEXACO STAR
A publication of
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135 East 42nd Street, New York 17, N. Y.

OIL FACES THE FUTURE WITH CONFIDENCE

EDITOR'S NOTE: *Augustus C. Long, Chairman of the Board and Chief Executive Officer of the Company, recently addressed the New York Society of Security Analysts. The following editorial is adapted from his remarks. It puts into perspective some of the challenges faced by the oil industry.*

FOR MANY YEARS in the oil industry, management has been primarily concerned with the technical and operating problems of finding, producing, refining, and marketing petroleum and petroleum products, both here and abroad. But in recent years the involved political and social problems of this country and the world have placed new and different obstacles in the path to successful business operations.

• • •

For instance, consider the continuing attacks on percentage depletion. More than three decades ago Congress enacted a provision of the Federal tax laws which recognized the unique problems of all extractive industries. This provision permits the producer of crude oil and natural gas to deduct 27.5 per cent of gross income in computing his tax each year, providing that in no event shall the deduction be more than 50 per cent of the producer's net income from each producing property.

The effect of percentage depletion has been to provide the oil producer with the incentive to continue the costly and risky search for petroleum. It also recognizes that the value of oil in the ground is for all purposes a capital asset and should not be subject to ordinary income taxes when depleted through production.

During the past year there have been proposals that the depletion rate be lowered or at least modified on a sliding scale. Yet studies indicate that should Congress take such action it is probable that the decline of activities in the oil industry would result in total revenues to the state and Federal governments being lowered rather than increased. In Texaco's opinion, there is absolutely no justification for proposing such discriminatory action.

President Kennedy has indicated he will take a look at all taxes, including percentage depletion, in connection with the resources requirements of our country. Texaco is confident that any fair study will show that percentage depletion is directly responsible for this country's adequate supply of low-cost energy. It would be risky business to tinker with a tax device which has produced this result. Texaco is equally confident that such a study will show that the oil industry generates, and bears the burden of, more than its fair share of the state and Federal tax revenues of our country. Its tax burdens should be decreased rather than increased.

• • •

Another issue which threatens to restrict the use of fuel oil and natural gas is that of end-use controls.

The coal industry has recently embarked upon a campaign to promote a study by the Federal Government of the nation's fuel resources. The net effect of the proposed study would be to establish end-use control of all fuels, and the coal industry hopes to regain through legislation the position that has been lost through competition with oil and gas.

This represents unwarranted and dangerous governmental interference in the consumer's choice of fuels. The adoption of such a scheme would in effect deny the basic principle of the free market. The petroleum industry, however, has

pledged its cooperation in any impartial, objective study of the country's fuel resources which Congress or the Executive Branch of the Government may see fit to undertake.

• • •

While we recognize that it would be unwise to flood this country with foreign oil, we are strongly opposed to the present arbitrary and inflexible system of mandatory import controls. A basic defect is that it permits companies with no foreign investment or historical pattern of imports to receive allocations of foreign crude based strictly on domestic refinery runs. This in itself is discriminatory because it fails to take into consideration the great economic risks which companies like Texaco assumed in order to develop oil resources abroad, in many cases with the encouragement of our own Government.

Under the mandatory system, furthermore, we run the risk of impairing this country's relations with friendly oil-producing nations overseas by interfering unduly with the free play of competition in international petroleum.

It is Texaco's position that a far more desirable arrangement could be achieved through a system of tariffs. The current volume of imports would be taxed at one level, and increases at much higher levels. We also believe a refiner receiving an import quota should be required to process that imported crude in his own refinery. These changes would substitute the laws of economics for what is fast becoming a patchwork of arbitrary decisions.

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Another problem which threatens increased consumption of our principal product is that of increasingly burdensome excise taxes.

In 1959, despite the fact that the House Ways and Means Committee repeatedly voted down proposals to increase the Federal gasoline tax, the Administration finally forced through a temporary one-cent increase. Although the enabling bill specified that the tax would expire June 30, 1961, and be replaced by the proceeds from 50 per cent of the automotive excise tax, the ink was hardly dry before the Administration called for making the increase permanent, and, in fact, adding to it by another one-half cent. This would make the Federal gasoline tax four-and-a-half cents, which when added to the average state tax of six cents, is 10-and-a-half cents a gallon. This happens to be 100 per cent of the current refinery price of regular-grade gasoline, and represents an excise tax on an essential product which is higher than that on luxuries such as jewelry and mink coats.

Texaco and the oil industry certainly favor the construction and building of adequate highways. But we feel it is unfair to ask the highway user to pay higher taxes when more than 40 cents of each dollar he pays to the Federal Government is diverted to purposes other than roads.

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In the international field, efforts are being made today by producing countries to find some method of prorationing that would in effect guarantee the continuation of their oil revenues at present or higher levels. This is a laudable objective, but in working out the methods of attainment, it is vital that those countries which have fared so well under the present arrangements retain the principles necessary to success in all international commerce. First and foremost of these, without which no nation or company can do business with others, are those which support free enterprise in the market place and the sanctity of contracts between the participating parties.

Consider the tremendous gains made by the oil-producing countries of the Middle East. Without having to make one cent of investment to provide the manpower, machines, or know-how, the four principal countries—Iran, Iraq, Kuwait, and Saudi Arabia—in the past 10 years have received payments that have gone from $125 million to almost $1.25 billion—an increase of 900 per cent in one short decade.

The present working arrangement has produced great benefits to these countries, and before any decision is made to alter it, everyone concerned should consider the wisdom of preserving it. Certainly, if it is to be altered, it cannot and should not be done on a unilateral basis—there are many interests which must be considered and protected.

• • •

Last in the group of current problems is that of Soviet economic penetration in the free world. American international companies undoubtedly will experience difficulties as a result of Soviet competition, but these will be limited principally to political areas. Oil is the principal earner of exchange for the Soviets, and their desire to achieve political ends will be tempered by what, even to the Russians, are the hard facts of economics; so we cannot believe that they will be too anxious to upset their relatively small markets. Also, with the annual increase in world consumption, Soviet penetration should be absorbed without much price destruction.

• • •

In spite of this rather imposing list of challenges Texaco today feels fully confident of the dynamism and future growth potential of the oil industry. During the next 10 years it anticipates that the free world's consumption of petroleum products will increase five to six per cent annually and that the petroleum industry will have to supply some 12 million barrels per day more than at present. This means that free world demand will go up from almost 19 million barrels a day at present to some 31 million barrels a day by 1970, or an average of over one million barrels a day each year. Moreover, it is quite possible that the rapid economic and industrial progress of the newly independent nations may shift even this estimate further forward.

Texaco is in a strong position to participate fully in the world's continuing need and demand for an adequate supply of low-cost energy. Today, including our equity interest in other companies, we produce, refine, and sell more than one and one-third million barrels of crude oil or petroleum products a day.

Our operations are both flexible and in balance, and we are in position to take advantage of opportunities for continued growth and development whenever and wherever they arise.

The new cumene plant at the Company's Eagle Point refinery.

PETROCHEMISTRY: A NEW PACE FOR PETROLEUM

Annual growth in petrochemicals is more than three times faster than that of the rest of the nation's industrial expansion

IN LESS THAN TWO DECADES a strip of Gulf of Mexico coast that runs from New Orleans to Brownsville, Texas, has become the largest concentration of petrochemical activity in the world.

This is the "Golden Crescent," a 100-mile swath of land containing more than 80 per cent of all petrochemical-producing capacity in the United States. Here, too, are America's greatest petroleum fields and refineries, where thousands of barrels of crude oil flow daily from wells that hold millions more in reserve. And the by-products of petroleum refining form the very core of the petrochemical industry.

Fresh water is plentiful; economical water transportation, to ship products along coastal routes to Eastern consumers or up the Mississippi River to Midwest markets, is immediately available.

Along the Crescent, clusters of petrochemical facilities poke the Louisiana and Texas skies with storage tanks and fractionating towers.

The two largest areas are at Houston and at Beaumont. Alone, they account for more than 30 per cent of America's total petrochemical production.

Throughout the Crescent there are numerous pipe lines which transport petrochemical raw materials and intermediates. One of the networks in this sprawling "spaghetti bowl" system interconnects Texaco's Port Arthur and Port Neches Plants, and the Company's nearby petrochemical-producing affiliates.

Already the fastest-growing segment of America's giant chemical industry, petrochemicals accounted for over 30 per cent of all chemicals produced in the United States in 1960, and about 60 per cent of the year's total chemical sales volume. Over the past 10 years, the average annual petrochemical growth rate has been nearly 15 per cent, compared to an average of only four per cent for the American economy as a whole.

Much of this growth rate is due to the petrochemical marketing potential in such areas as plastics, synthetic fibers, synthetic rubber, detergents, and paints. In a single year, as many as 500 new products, made wholly or in part from petroleum-derived materials, appear on the market. For the petroleum industry, there is the added attraction of converting crude oil in excess of market demands into profitable petrochemical products.

Actually, the word "petrochemical" is a misnomer. It means "rock alchemy" and does not refer to an industry or a class of product at all. Generally speaking, though, it is used to describe a chemical material made from hydrocarbon raw materials, extracted wholly or very largely from petroleum or natural gas sources.

Production-line, or basic, petrochemicals cover everything from elementary materials—such as acetylene, ethylene, propane, butylene, butadiene, and benzene—to such intermediate materials as alcohols, acetaldehydes, glycols, and certain chlorine derivatives.

A few inorganic materials, like ammonia and carbon black, for instance, also are usually listed under the general heading

During World War II, Texaco contributed importantly to the success of synthetic rubber production, among many other projects

of petrochemicals. That is because natural gas or petroleum fractions are used as raw materials for their production.

To the layman, often unaware that these petroleum derivatives are becoming, more and more, a part of his everyday life, the terminology of petrochemistry is associated with the mysterious world of science.

But there is nothing mysterious about the growing list of petrochemical-based products: synthetic materials like Nylon, Orlon, Dacron, and Acrilan are replacing many natural materials and, in many cases, doing a better job. Plastics, in which petrochemicals are highly important, are used for just about everything. Some 200 plastic parts go into a typical automobile, and plastics are found in just about every household item from baby bottles to beach chairs.

Petrochemicals, as a matter of fact, have become a valuable and integral part of our living. They are used in the manufacture of such diverse products as synthetic detergents, fertilizers, insecticides, floor tiling, pharmaceuticals, gasoline, lubricating oils, and antifreeze.

For motorists, the most common encounter with petrochemicals is at the neighborhood service station. Petrochemicals are used in the components of Texaco Sky Chief Su-preme Gasoline that help create its excellent performance characteristics. Petrochemistry—in the form of additives—helps give Texaco's Havoline Motor Oil its remarkable stamina under severe operating conditions, and its ability to clean the motor as it lubricates. Petrochemicals are used in Texaco PT Anti-Freeze (its principal component is ethylene glycol, produced by Jefferson Chemical Company —a Texaco affiliate).

The petrochemical industry has always been tied to the petroleum and natural gas industry through their buyer-supplier relationships. But another kind of relationship also draws these industries together. Except in a few cases, most petrochemical processors do not market their products directly to the general public, but pass them on to other industries or even to other petrochemical firms until, eventually, the consumer product appears.

This method of operation is no novelty to the petroleum industry. Perhaps more than any other major industry in the United States, oil and gas companies are in a position to understand and make use of the business conditions that encourage petrochemical development.

Texaco began to engage in petrochemical research and develop methods for commercial production of chemicals from petroleum raw materials shortly after the end of World War I. As early as 1912, a Company chemist experimented with the extraction of naphthenic acids from crude oil to determine their properties and uses; and Texaco produced toluene, the basic ingredient in TNT, during World War I.

For all purposes, though, the start of the petrochemical industry in the United States is generally placed in 1920 when isopropyl alcohol was first produced in commercial quantity. Not far behind came the first commercial production of ethylene and ethylene derivatives.

But it was not until the late 1920's and early 1930's that the industry really began to take form and develop. In 1928, methanol and formaldehyde (from natural gas) appeared on the market; in the early 1930's ammonia (again, from natural gas), butyl alcohol, methyl ethyl ketone, and then a variety of other acetone derivatives were introduced. About the same time work was begun on a commercial method of producing butadiene from hydrocarbons.

During these years the large chemical companies dominated the field of petrochemicals, purchasing from oil companies the refinery and oil field by-products that make up the petrochemical industry's principal raw materials. Lacking the technical experience so vital in a field that was still highly experimental, few oil companies were willing to put down the huge capital sums necessary to go it alone.

Most of them, including Texaco, moved cautiously, content with expanding only their petrochemical research activities at first. But the attraction to engage in the large-scale commercial manufacture of petrochemicals was strong.

Texaco's first step into commercial petrochemical production came in 1923, when the Coltexo Corporation was formed with Texaco holding a 49 per cent interest and Columbian Carbon Company holding the other 51 per cent. Coltexo's two plants are located in the Texas Panhandle, and its principal products include dry natural gas, natural gasoline and LPG, and channel-type carbon black.

Throughout the 1920's and 1930's more and more petrochemical companies sprang up along the Crescent. Still, the petrochemicals industry moved slowly; what it lacked, mostly, was direction.

That direction came when World War II broke out. After Pearl Harbor, the United States was cut off from its supplies of natural rubber and oil in the Far East. For a nation fighting a war on wheels and in the air, the situation became an overnight national emergency.

The Government immediately initiated crash programs to develop synthetic rubber and high-octane aviation gasoline. By then, the petroleum industry had progressed sufficiently in the development of petrochemicals to contribute a new source—a synthetic source—of these and other vitally needed war materials.

Cumene, for instance, is an antiknock component of aviation gasoline, and Texaco, through petrochemistry, helped supply synthetic cumene in large quantities. The Company,

together with other oil companies, developed a chemical process called alkylation that made possible the economical, quantity production of high-octane aviation gasoline itself.

To help meet the Government's wartime need for rubber, Texaco moved directly into the production of butadiene—one of the major starting materials in synthetic rubber manufacture—through its association with the Neches Butane Products Company. The Neches Butane plant, still the world's largest for the production of butadiene, was built during the war by the Government on the flat coastal prairie at Port Neches, Texas, a few miles from Texaco's mammoth Port Arthur Plant. Texaco and four other oil companies assumed responsibility for the operation.

Later, in 1954, the Company's petrochemical interests were augmented again when Texas-U.S. Chemical Company, a jointly owned enterprise in which Texaco shares 50 per cent ownership with U.S. Rubber Company, was formed. The following year, when the Government relinquished ownership of the Port Neches plant, Texas-U.S. purchased one-half interest in the Neches Butane Products Company.

Texas-U.S. also bought a nearby synthetic rubber plant, and the company uses its share of the Port Neches plant butadiene production capacity to process butylenes purchased mainly from Texaco's Port Arthur Plant. Some of the butadiene is sold, but most of it is combined with purchased styrene at the rubber plant, which has a capacity of about 125,000 tons of synthetic rubber a year.

Another important element in Texaco's participation in the petrochemicals field lies in its connection with Jefferson Chemical Company, Inc. During World War II, Texaco and American Cyanamid Company made plans to go into the petrochemical business. In 1944, the Jefferson Chemical Company was formed—a 50-50 partnership that the two companies felt would benefit by Texaco's knowledge of petroleum technology and supply of raw materials, and American Cyanamid's knowledge of the chemical industry.

An 1,100-acre plant site was selected in Texas, near Port Neches and also close to Texaco's Port Arthur Plant. While the plans were still on the drawing board, the Jefferson plant was doubled in size. It was completed in 1948 and, two years later, another 50 per cent enlargement was built. Again, in 1956, management gave its nod to a nearly $40 million program to expand and modernize Jefferson's facilities.

The company's first process development group, known as the Experiment Unit, utilized some of Texaco's Port Arthur facilities until its Austin (Texas) Laboratories opened in 1949. Except for a small amount of specialized chemicals produced here, all of Jefferson's manufacturing activities are concentrated in the Port Neches plant and in a smaller installation at Conroe, Texas.

One of the most versatile products turned out at Jefferson is ethylene, a petrochemical made by cracking refinery gas from Texaco's Port Arthur Plant. From this basic component a whole series of highly reactive intermediates, used in the making of a wide variety of chemicals, are produced.

In the Port Neches plant's newly completed ethylene unit, part of the 1956 expansion program, high purity propylene (an important component of plastics) also is made and used to make such intermediates as propylene oxide and propylene glycol. Jefferson also manufactures its own chlorine and caustic soda. The caustic soda is sold, and the chlorine is used to make ethylene oxide and propylene oxide.

Constantly looking for petrochemicals that will produce either economical substitutions for existing products or completely new uses not previously developed, Jefferson Chemical devotes substantial sums to new product development.

Recently, Texaco has become more and more interested in producing certain petrochemicals within the Company. As part of Texaco's program to increase its own direct participation in the petrochemical business, the Company put one of the world's largest cumene plants on stream at the Eagle Point (New Jersey) Plant in 1960. Cumene, once used as a high-octane blending stock for aviation gasoline, has become one of the principal raw materials for producing the synthetic phenol and phenolic resins that help make up many common household plastics, textiles, detergents, germicides, and plywood adhesives.

In 1960, plans for construction of a benzene plant at Port Arthur, scheduled for completion about mid-1962, were also announced. Benzene is one of the major sources of cumene, and a lot of the new plant's estimated 30-million-gallon annual production will be used by the Eagle Point plant.

Port Arthur is also the site of Texaco's first wholly owned petrochemical venture: an additives plant, completed in 1957, which actually consists of four separate plants. One unit contains the fractionation equipment that prepares raw materials for additive manufacture from stocks brought in from the Port Arthur refinery. This section also prepares diisobutylene, a component of plastics.

The other three plants involve four or five chemical upgrading steps and each produces a carefully controlled petrochemical product. Various blends of the chemicals from these three plants produce the additives required for Havoline Motor Oils and Ursa Heavy Duty Oils, for example.

Bulk shipments of ethylene glycol, addititives, and diisobutylene are made from Port Arthur Terminal to numerous East Coast ports aboard Texaco tankers, equipped with special compartments to handle these chemicals. This method results in a considerable saving over tank car shipment costs.

A year after the Port Arthur additives plant was completed, Texaco built an ammonia plant at its Lockport (Illinois) Plant—in the heart of the rich Midwest farm belt and close to Chicago. In this section of the country ammonia is an important fertilizer, and the Lockport Plant produces about 180 tons of ammonia a day.

In fact, about 75 per cent of the country's ammonia production is used for agricultural applications. Anhydrous, or waterless, ammonia may be used directly as a fertilizer. Most

Already the fastest growing branch of the nation's chemical industry, petrochemical product potential has been expanding, too

of it, however, is upgraded as ammonium nitrate or urea, which also can be used as a fertilizer or as the components of even more complex fertilizers. In industrial applications, ammonia may be used as a refrigerant or as an acid neutralizing agent; converting it to nitric acid makes it an important material for the manufacture of industrial explosives.

Perhaps the most important contribution Texaco has made in this area is the development of a process called the Texaco Partial Oxidation Process. Licensed by the Texaco Development Corporation for commercial use all over the world, this development converts natural gas, oil, and coal by hydrogen or mixtures of hydrogen and carbon monoxide to produce ammonia, methanol, and other chemicals.

The advantage of such a system is a tremendous one, particularly to people in the many areas of the world where natural gas is not available, and yet who vitally need ammonia.

Although the success of Texaco's Partial Oxidation Process among European chemical firms has meant a lot in prestige value, the Company first gained an important overseas petrochemical activity with the purchase of The Trinidad Oil Company Limited, in 1956.

From the Pointe-à-Pierre refinery comes such petrochemicals as naphthenic acids (used in paint driers), propylene tetramer (used in synthetic detergents), di-isobutylene, and sulphur. Except for the sulphur, all of which is sold in Trinidad, the bulk of these products are marketed through outlets in the United Kingdom.

Since 1958, Texaco has continually expanded its chemical output in Trinidad (in 1961, it will build an aromatics processing facility). Naphthenic acid production has increased about 50 per cent and the development of a number of new propylene and butylene polymers has caught the interest of several European chemical manufacturers.

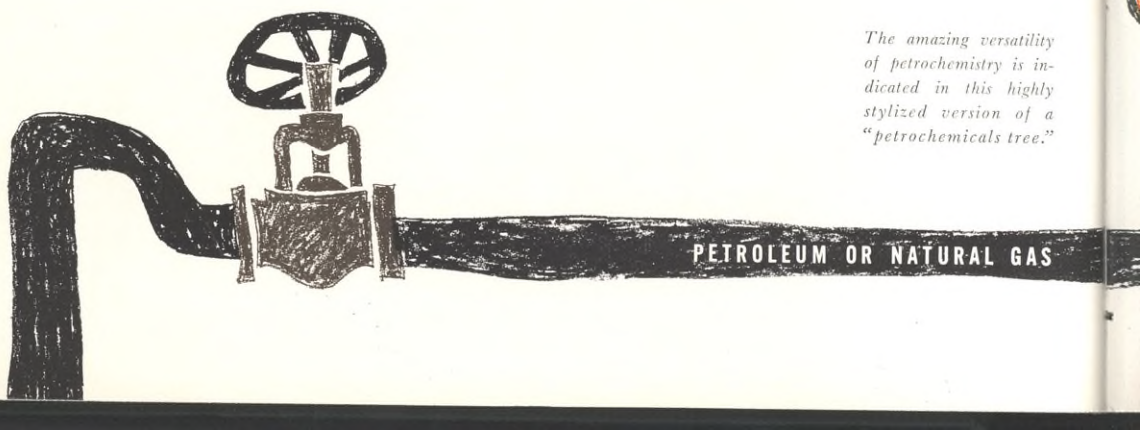
At home, research and development continues, not only to improve products already on the market but also to capture new export business with new products. Following the general trend throughout the industry, the post-World War II years have brought the greatest research activity.

Texaco's Research and Technical Department, however, began over 30 years ago to produce small quantities of petrochemicals—naphthenic acids and sulfonates, mostly—used mainly in the manufacture of fuels and lubricants. Today, their efforts have helped create an industry whose total sales last year were more than $6 billion.

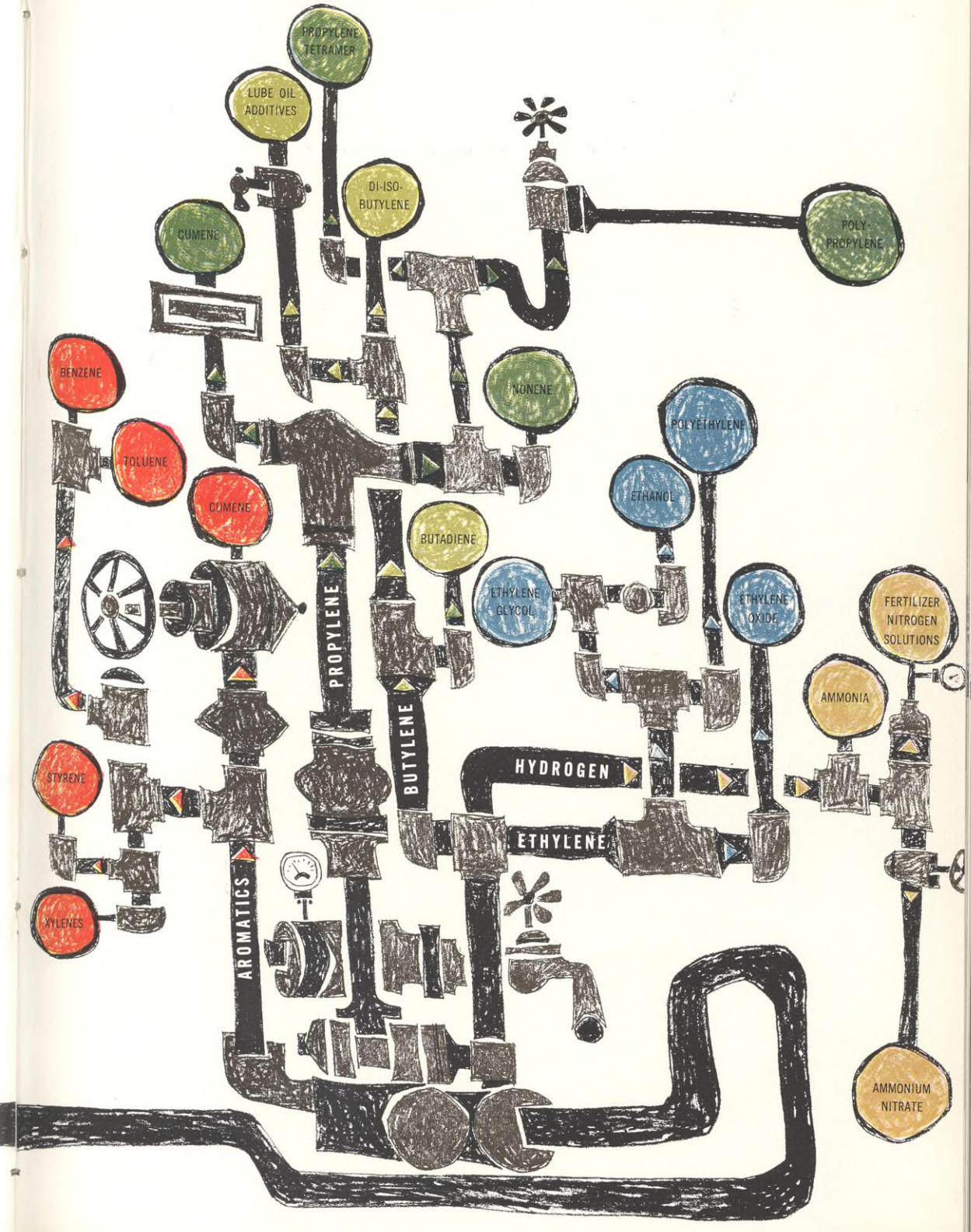
A recent survey, conducted by the Manufacturing Chemists' Association, Inc., shows that chemical production and research facilities costing an estimated $1.6 billion would be constructed in the United States during 1960-61. This includes $1.2 billion for construction already begun and $485.5 million for projects scheduled for early groundbreaking and completion before 1962. In 1959, an estimated $1.3 billion was spent, bringing the total construction costs for the three-year survey period (1959-61) to about $3 billion.

The future could hardly be more promising; petrochemists already know nearly *one million* compounds that can be made from petroleum, and new ones are being found every day. Traditionally, the aim of the petroleum industry has been the recovery of the *energy* content of crude oil. Now, through petrochemistry, that aim has been broadened to include recovery of the vast stores of organic chemicals that are based on the hydrocarbons of crude oil.

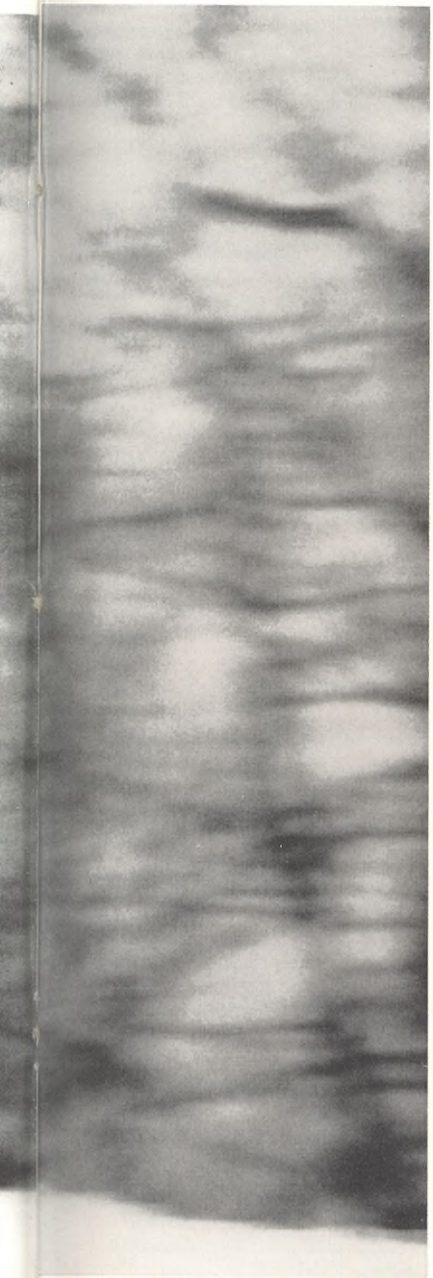
Whatever new synthetic products may appear—and there will be a lot of them—petrochemistry has brought about a revolutionary way of living that is out of *this* world. •



The amazing versatility of petrochemistry is indicated in this highly stylized version of a "petrochemicals tree."


PROPYLENE TETRAMER
LUBE OIL ADDITIVES
DI-ISO-BUTYLENE
CUMENE
POLY-PROPYLENE
BENZENE
NONENE
POLYETHYLENE
TOLUENE
ETHANOL
CUMENE
BUTADIENE
ETHYLENE GLYCOL
ETHYLENE OXIDE
FERTILIZER NITROGEN SOLUTIONS
PROPYLENE
BUTYLENE
AMMONIA
HYDROGEN
STYRENE
ETHYLENE
XYLENES
AROMATICS
AMMONIUM NITRATE

For sheer excitement, nothing compares with whizzing down a hill on skis, and millions of Americans



currently are experiencing the thrill every Winter.

TO THE HILLS!

IN THE LAST FEW DECADES, several million Americans have learned at least two basic principles of skiing, regardless of how many of its fine points they may have mastered along the way.

The first is that one has to go up to come down.

The second is that one almost always has to travel quite a considerable distance from home before one finds a slope to come down.

Unless the ski buff is lucky enough to live in a ski area, he has a long trip ahead of him when he sets out for a week end of slaloms and schusses. For a New Yorker, it is not at all uncommon to drive 600 miles between Friday night and Monday morning for the privilege of shooting down

Adjusting their bindings, above, *three skiers get ready to go down one of Stowe, Vermont's, advanced slopes.* At right, *a tot learns one of the basics—"snowplowing."*

a mountain in Vermont or New Hampshire. If that seems like an inordinately long haul to the non-skier, it does not discourage the enthusiast. The real fan pursues the white trail as ardently as Ahab went after the White Whale.

On a busy Winter week end in a typical skiing center like Stowe, Vermont, where the photographs on these pages were taken, the slopes swarm with as many as 5,000 men, women, and children (if his parents are rabid skiers, a youngster is likely to be in boots almost as soon as he's out of booties).

Traffic on the roads between lodges and the slopes remind one of rush hour in a big city, and the parking lots stay filled as long as the mountains stay snowy. Aside from motoring, skiers take planes, trains, and buses to their favorite slopes — in recent years the "ski train" has become as familiar, almost, as the hayride.

Things were not always thus. Twenty-five years ago, skiing was considered by many to be slightly *déclassé,* and by many others to be a rich man's sport. Today it is not only fashionable but reasonable, and if the American skier wants to test his skills as far away as Switzerland, he can take a special skier's flight that costs just under $500, including room and board, for a two-week vacation. Flying by jet, he can be in St. Moritz almost as quickly as he could make it from New York to one of the Eastern slopes in his auto.

Going to Switzerland or Austria is the ultimate, though — not the ordinary. Thousands of students and budgeting families simply drive to the resort nearest them and stay in dormitories for the week end, for as little as six dollars a day per person. (At Stowe, accommodations range all the way from barn-like dormitories, in which younger people cheerfully stay, to extremely posh lodges in which the guests are asked to dress for dinner.)

No matter how he travels, or how far, the skier *must* travel; and this has had a salutary if uncharted effect on the Wintertime sales of gasoline and oil, not only in ski areas but also along the routes that lead to them. There has been a remarkable, and documented, effect on the sales of ski equipment, too. It is reported by a leading magazine in the field — skiing has developed a prolific literature — that Americans in 1959 spent about $20 million on skiing gear. Presumably, this very sizable sum was spent by skiers who figured they were in the sport to stay, because anyone venturing out for the first time can rent all the equipment he needs by the day or week.

Along with the phenomenal growth in the popularity of skiing here (it is estimated that about 3.5 million Americans ski at least occasionally), there has come a keen concern for the skier's safety. It is inescapable that skiing holds inherent

Bundled in a blanket, above, *a skier arrives at the top of one of Stowe's chair lifts. Meanwhile, a group of fans relax in a warming hut,* at right.

hazards. Any activity involving high speeds does. But the various skiing associations around the country work hard and long to hold the skiing accidents down to a minimum.

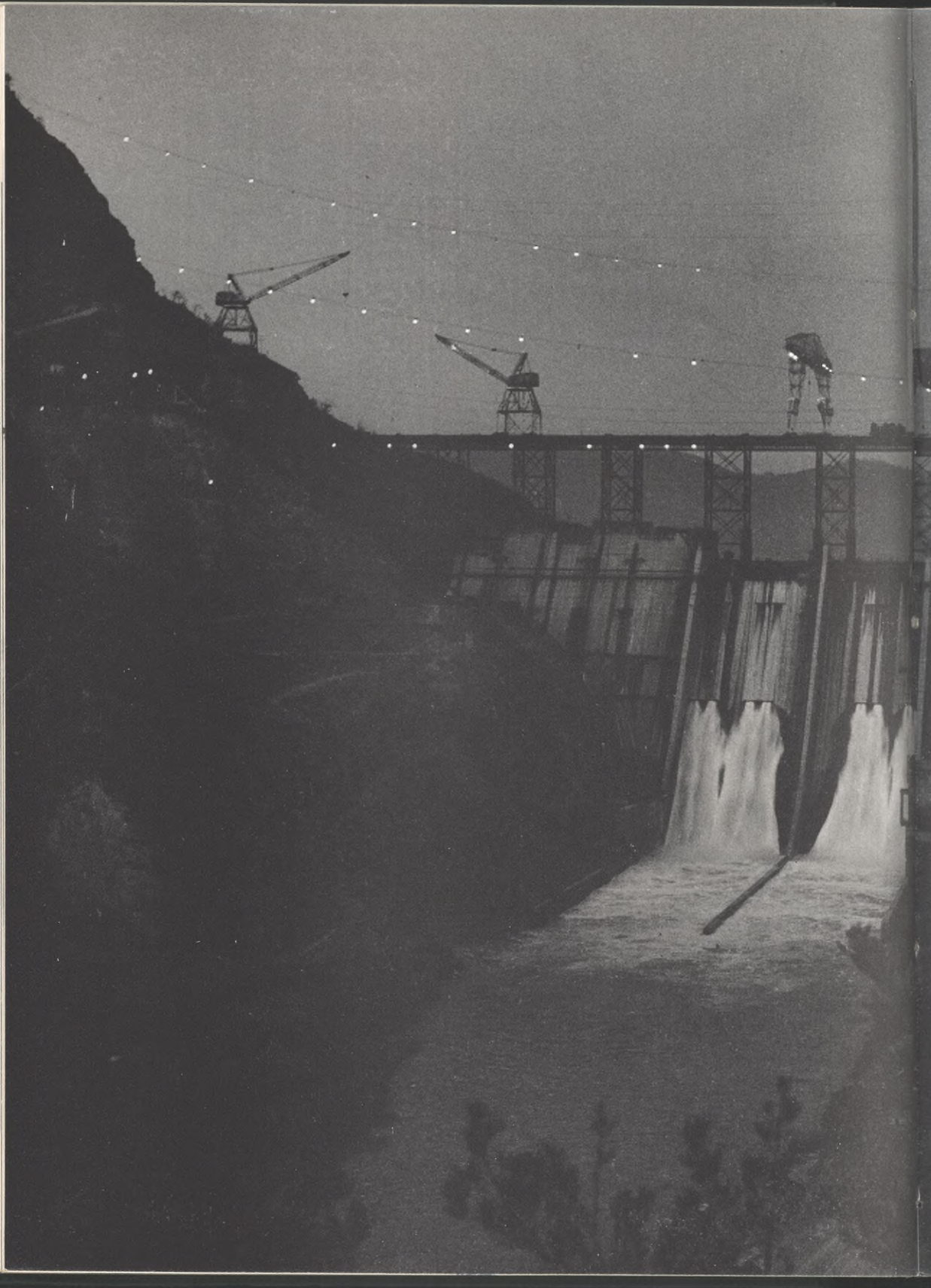
One system used at all major areas is the ski patrol, a corps of expert skiers who volunteer for guard duty on the slopes, keeping an eye out for potential trouble. One of the most common causes of skiing injuries comes from the skier tackling a slope too advanced for him, and losing control. Sledding injured skiers to medical help is an important part of the patrols' work, too. This is a mission that takes terrific skill and strength, because it requires the patrol member to "snowplow" down the mountain, crouching all the way, as he guides the litter carrying the injured skier. The trip can take an hour or more, and anyone who has stayed in a crouch as long as five minutes can appreciate what an exhausting effort this means.

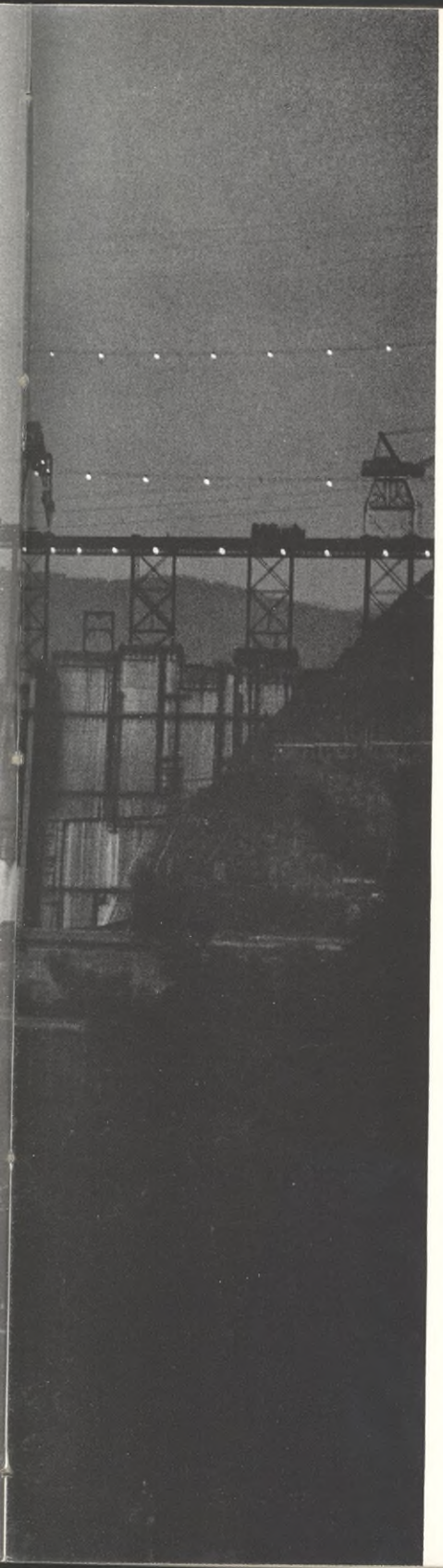
Skiing these days is pretty much a family sport; a fact that has changed its character from the breakneck, thrill-a-minute adventure it once was to a much more sane, though still swift, pastime. Every major ski area also takes pains to let the skier know just what he's in for before he starts up a particular slope, by posting maps in the warming houses at the bases of slopes that tell whether a trail is meant for novices, intermediates, or experts.

The terrific enthusiasm for skiing in America in recent years has had a decided effect on the nation's development of top-ranking serious skiers, and its Olympic teams have been among the very best in the competitions held recently.

The country's reputation as a *place* to ski has grown, too: last Winter's Olympics were held at Squaw Valley, California, rather than at one of the traditional centers in Switzerland or Austria. If skiing in California seems odd, incidentally, one should remember that there is excellent skiing in Arizona; on Mount Parnassus, in Greece; and in the Guadarrama Mountains near Madrid. As a matter of fact, skiing on sand dunes is a popular sport in South America — and skiing in the living room, if it has a ceiling high enough, just recently was made possible by a manufacturer who introduced a sort of escalator without steps, covered with a white nylon carpet that looks and feels like powder snow. This ingenious device glides forever upward at about 15 miles an hour; if the skier coming down keeps the same pace, he can ski as long as his legs hold out.

It does not seem likely that the invention will keep many skiers at home as long as there is *real* snow in the mountains. The sport unquestionably will continue to make Winter travelers by car, plane, and train out of thousands who once stayed home. These photos show what keeps them going. •





NEW ENERGY FOR THE PUNJAB

Built on a river gorge in the Himalayan foothills, the dam will bring hydroelectric power to the Punjab and irrigate the farms of northern India

ALONG INDIA'S NORTHERN BOUNDARY the spiny Himalayan range swings, scimitar-shaped, from Pakistan to the Burma border. For centuries civilization ignored this barren, nearly uninhabitable land. Even today, as man reaches out into space, the towering Himalayas have been breeched with only a few crude passes. Just below this forbidding mountain range lies the Punjab, one of the northern states of India.

Farmers, mostly, the people of the Punjab have remained relatively untouched, clinging to ancient traditions and primitive ways of life.

Here, life is raw and hard, a ceaseless struggle against the blazing sun and the monsoons. In the past, the Punjabi people were helpless before the terrible forces that nature, unchecked, can unleash. This far north the rainfall is unpredictable and, during the stifling Summer months, many farmers watched their crops wither beneath the sun. There was no way of storing water in the rainy seasons and using it to irrigate fields when the droughts came each year.

Then, when the riverbeds themselves were dry and cracked, came the monsoons out of the south. In minutes, rain-swollen clouds turned the Punjab's five main rivers (in Sanskrit, the Punjab means "five rivers") into raging torrents that swept away whole villages, drowned thousands of people, and caused inestimable crop damage.

But in recent years all this has been changing, and the entire economy of northern India along with it.

The catalyst that has brought about this economical upheaval—a change that neither the genius of Alexander the Great nor the barbaric ruthlessness of Tamerlane could accomplish—is the $389 million Bhakra-Nangal Project. Scheduled for completion late in

The project, scheduled for completion this year, will alter the economy of all northern India

1961, the main purpose of this long-range project is the development of irrigation facilities and hydroelectric power generation for use throughout the states of Punjab and Rajasthan—an area roughly three-and-a-half times larger than New York State.

A joint enterprise of the Punjab and Rajasthan governments, the program will irrigate about 6.7 million acres of Punjabi territory, and generate over one million kilowatts of electrical power to run the area's flour, cotton, and textile mills. The project consists of a generating dam with two powerhouses, a power plant and transmission system to carry electricity into farmlands and southward to the cities, a smaller diversion dam, and a network of irrigation canals.

Keystone of the entire project is the 740-foot Bhakra Dam, now nearing completion on a deep gorge of the Sutlej River in the Himalaya foothills. Already one of the world's largest dams, it will create a reservoir covering 68 square miles with a storage capacity of 7.4 million acre feet. Power from its generators will reach over 200 miles south to New Delhi, India's capital, to help meet that city's rising energy needs.

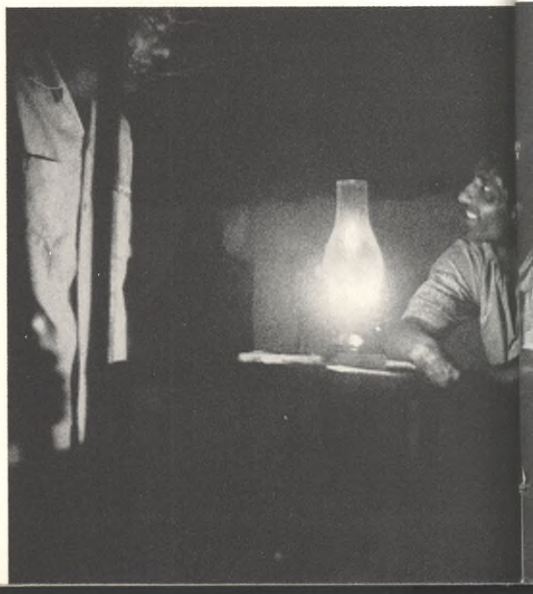
Supplying the major share of fuels and lubricants needed to complete the project is Caltex (India) Limited, one of the Caltex companies which are 50 per cent Texaco-owned. Sales representatives visit the dam site and, through the Caltex sales office in Chandigarh, make arrangements to service contractors with the oils, greases, and fuels necessary to do the job.

To keep an eye on construction progress and the installation of heavy equipment, a Caltex sales engineer lives at Bhakra, where he is available on 24-hour call. Since the project was designed to be as self-sufficient as possible, the sales engineer spends a lot of time eight miles downstream at Nangal, too, where virtually all the dam's metal-work—except powerhouse generators and doorknobs—is made. Here, Indian technicians bottle their own oxygen and acetylene, and recap huge tractor tires.

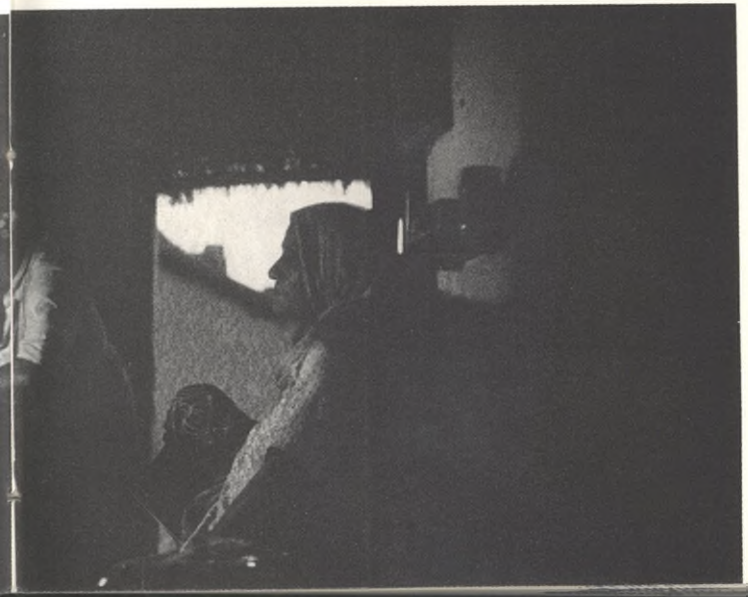
The self-sufficiency theory at Bhakra was the idea of the man in charge of the dam's construction, Harvey Slocum. Considered by leading engineers to be one of the best dam-builders in the world, Harvey Slocum has been seeing and solving construction problems on the spot—and many of those spots have been very remote—for a great many years.

Actually, the Bhakra Dam and Power Plant are the last units of the project to be finished. The program was envisioned over 50 years ago, but construction did not begin until the late 1940's as one of the most important undertakings included in India's First Five Year Plan.

Between 1954 and 1956, the 95-foot Nangal Diversion Dam, the 40-mile-long Nangal Hydel Channel (connecting Nangal with the village of Rupar farther downstream), and



Smoke-wreathed community charcoal ovens, above, *where Punjabi villagers get coals to heat their homes and cook their food, are just one of many age-old traditions that will be thrown off as the Bhakra-Nangal Project opens up the area to agricultural expansion and industrial growth.*



By the dusky light of a kerosine lamp, left, *a local farmer and his wife discuss the huge dam's progress with a project engineer in a Nangal tea stall. Electricity will soon light both tea stalls and homes; complex irrigation systems will control floods and drought to improve farmers' productivity.*

Caltex has been supplying the major share of fuels and lubricants needed to finish the job

the channel's two powerhouses were completed. At the same time, the Bhakra Canal—a complex grid including 108 miles of lined main canal and over 480 miles of branch canals—was finished.

Caltex, too, was on the job then; it supplied about half the fuels and lubricants needed during construction of the Hydel Channel's two powerhouses at Ganguwal and Kotla. Until the Bhakra-Nangal Project began, the Sirhind Canal was the major irrigation system for Punjab and Rajasthan. This network is still used and Caltex supplied all the fuels and lubricants used during the remodeling of the canal about 10 years ago.

Even before India's ambitious project is finished, the catalytic effects of it have already been felt. A new fertilizer plant, for instance, is being built at Nangal, using power from the diversion dam.

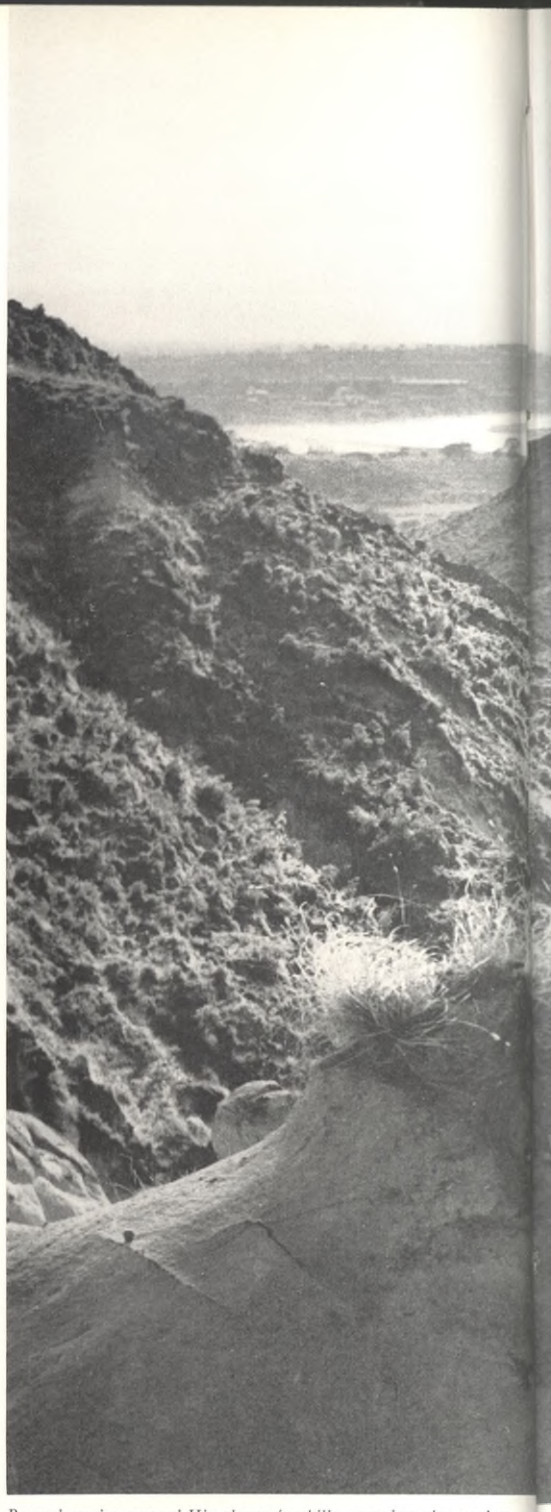
But it is in the flat Punjabi farmlands and the Rajasthani desert country that the project's greatest influence can be seen. Throughout these rural areas, as electricity begins to change the whole pattern of life, new townships and countless small villages are springing up. With them come refrigeration, powered well pumps, radios, and electric lights. Even the village blacksmith can begin using power tools to increase his productivity.

This steadily increasing agricultural growth means that more and more tractors, harvesters, diesel pumps, and trucks will be needed to plant, cultivate, harvest, and transport products from the fields to urban markets. And soon, too; economists predict that the new irrigation system will increase grain production by one million tons and cotton by over 600,000 bales annually.

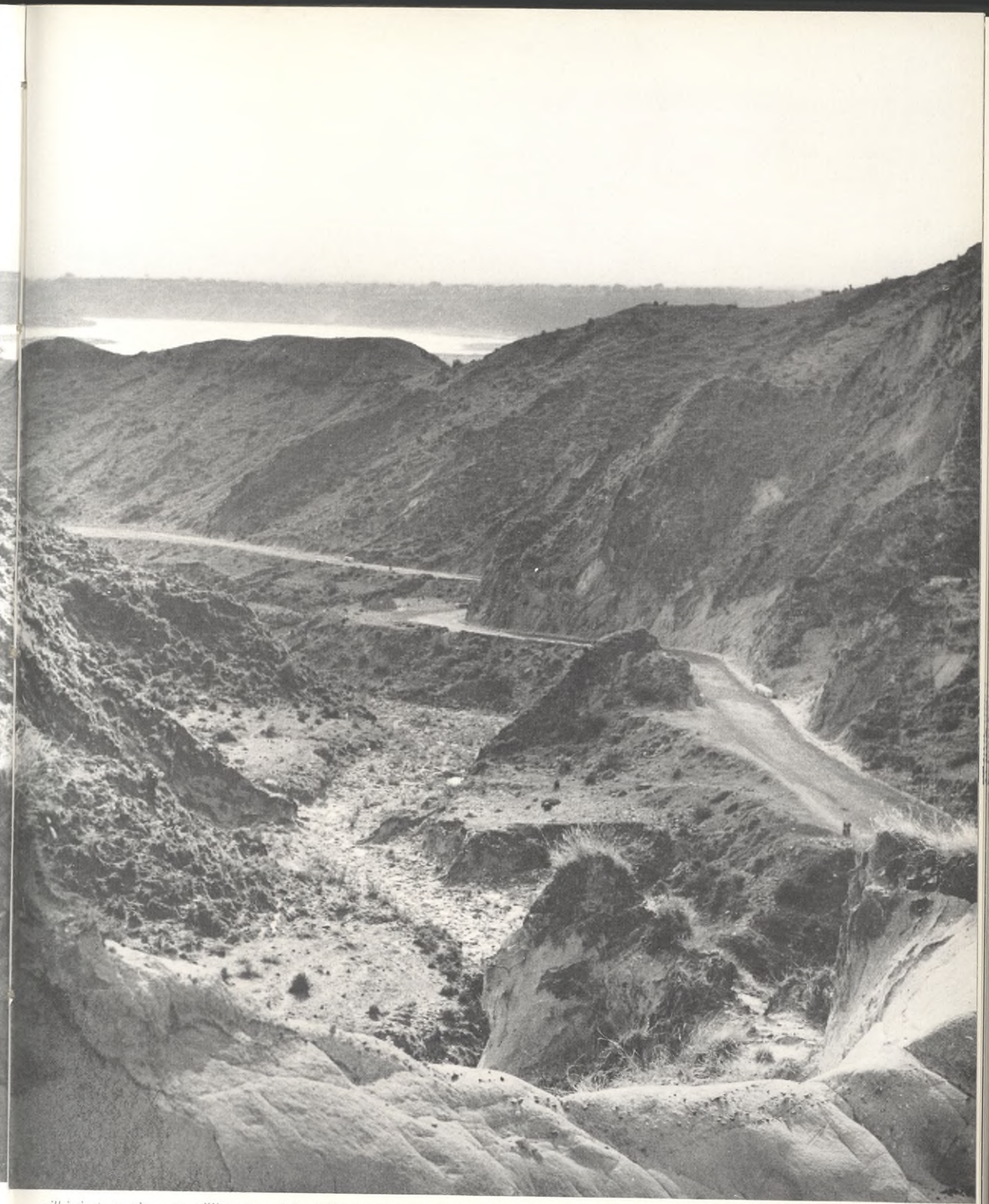
Also, in a broader sense, the Bhakra-Nangal Project will greatly stimulate the critical growth of India's middleground economy. Between the enormous industrial projects (such as the Caltex-supplied steel mills at Rourkela, Durgapur, and Bhilai, and the locomotive plant at Chittranjan) and the primitive villages (like Bhakra and Nangal) lies the vast middle economy from which such basic necessities as sewing machines, motors, and bicycles—together with hundreds of other consumer goods—will come.

This, perhaps, is the most important contribution that such projects make to India's economy, because the essential foundation of any healthy country is a steadily growing list of such products and, equally important, the ability to produce them.

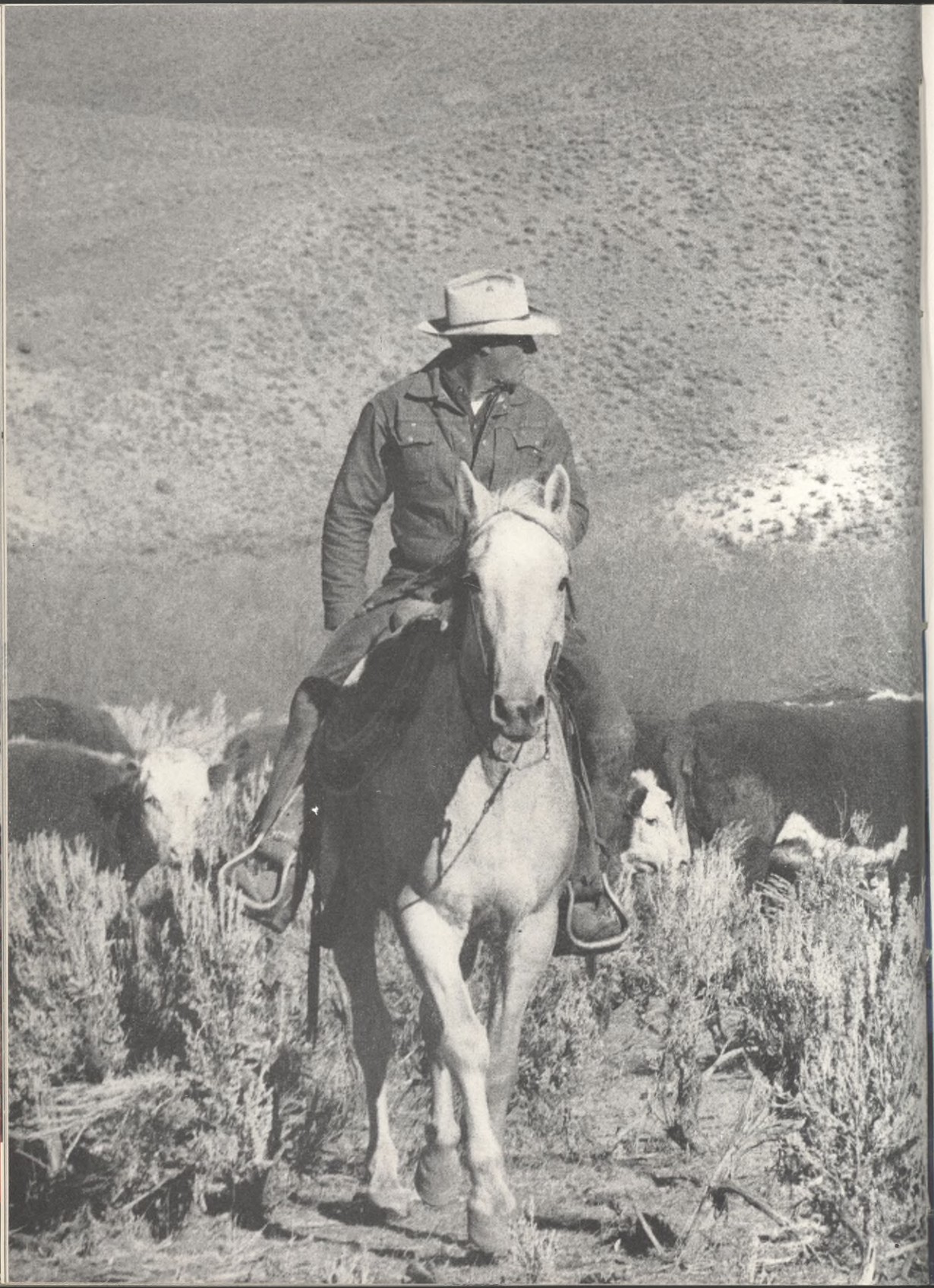
To India, these factors are even more essential; neither the products nor the ability to produce them existed before, and there is a lot of lost ground to cover. With the help of the Bhakra-Nangal Project's hydroelectric power and irrigation systems, it may not take long. •



Beyond erosion-scarred Himalayan foothills, near dam site, project



will irrigate nearly seven million acres of Punjabi land, generate electrical power to reach 200 miles south to New Delhi, India's capital.



BIG CHANGE ON THE RANGE

On today's huge cattle ranches, a man and his horse are still necessary; but a cowhand behind a steering wheel has become an increasingly familiar sight

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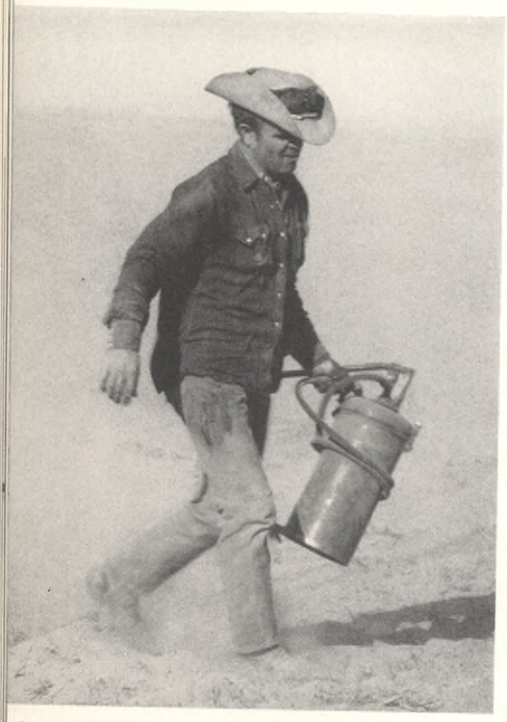


Down on the range, cowboys handle both grease gun and bridle.

RUNNING A BIG CATTLE SPREAD, as any nine-year-old can tell you, takes a corral-full of cow ponies and a bunkhouse full of "hands."

What he probably does not know, if his notions of ranching are the result of movies and television, is that the rancher and his cowhands today rely just as heavily on horsepower as they do on horseflesh — the horsepower in trucks, tractors, ranch wagons, and even helicopters and small airplanes.

Although the slap of leather and the jingle of spurs is still heard on the range, an increasing number of ranching chores are done with the help of machines; and a ranch hand is as likely to go about his work sitting tall in the bucket seat of a tractor, as he is sitting tall in the saddle. You can't cut a dogie out of a herd with an automobile, and a good quarter horse is still valuable for lots of ranching work; but more and more, machines are taking over on the jobs not strictly connected with herding.

This is not very surprising to anyone familiar with the trends in agriculture. In recent years, there has been a marked decrease in the number of farm units, and a tremendous increase in productivity-per-farm. The reason, obviously, is increased efficiency, and mechanization has had a great deal to do with that efficiency. (Better control of plant and animal diseases, enlightened soil conservation techniques, advances in hybridization, and more effective fertilization methods have played important roles, too.)

What is true of farms in the usual sense is true of ranches. The Census Bureau does not make a distinction between farms and ranches — for its purposes, a wheat farm and a cattle ranch are all one. But it can reasonably be assumed that the figures on the use of mechanical equipment in the Western states which are important cattle-raising states reflect the use of that equipment in cattle ranching more than in any other kind of food production. In Colorado, for instance, there is much more livestock farming (the city kid would call it cattle ranching; and so, probably, would most Americans) than any other sort.

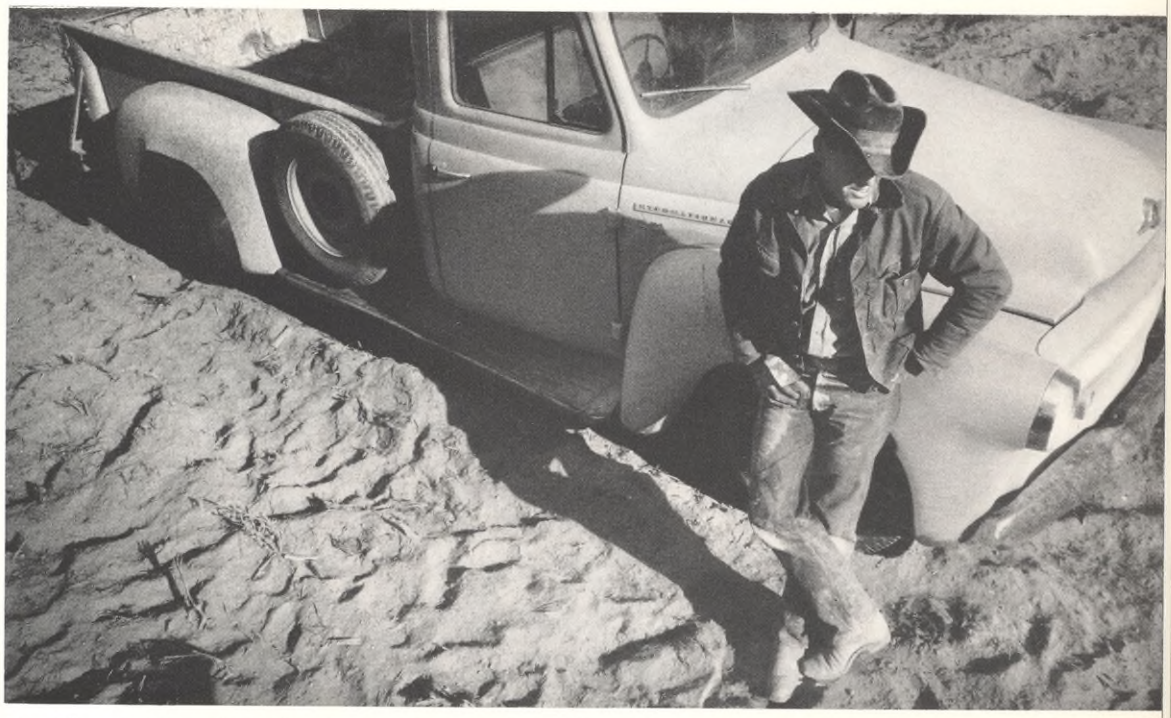
In that typical cattle-raising state, there are more than 70,000 tractors registered. The sale of gasoline and other petroleum products for farm use, according to the 1959 census, amounted to more than $26 million.

On the Nevada ranch pictured on these pages, about 10,000 gallons of gasoline are used every month — that's as much as some service stations sell — and hundreds of gallons of lubricants are consumed yearly.

These go into the pickup trucks that jounce into town for food and supplies; the ranch wagons used for spot checks on outriding crews of cowboys tending cattle up in the hills; the tractors and combines needed to work the fields in which Winter feed for the cattle is grown.

On the very biggest spreads, a helicopter or small plane often is used nowadays to patrol herds from the air, keeping a lookout for strays or sick cattle, and in the calving season making sure that newborn calves are not left behind when the herd moves. In Winter, the planes often are used to drop fodder to snowbound stragglers who otherwise would starve.

Punching leather still is an important part of ranching and perhaps always will be; but switching on the ignition is becoming more and more common. •



Meanwhile, back at the ranch, today's cattleman uses horsepower from both a pickup truck and a cow pony to help with the round-up chores.

TEXACO RATED TOPS IN INDUSTRY REPORT

In its 13th annual "Report on American Industry," *Forbes* magazine gave Texaco the highest rating of any of the large international oil companies. None of the 257 industrial corporations included by *Forbes* in its survey —in fields ranging from steel to paper and from packaging to soap — surpassed Texaco in over-all rating. The analysis further showed that Texaco ranked better than any other oil company studied in terms of growth in sales revenues and in rate of return on stockholders' investment. In addition, the *Forbes* survey found that Texaco was high among all leading companies in terms of profits resulting from new capital investments.

COMPANY GIFT HELPS AID CUBAN REFUGEES

Recently, Texaco Board Chairman Augustus C. Long announced a Company contribution of $100,000 to help set up relief work on behalf of Cuban refugees fleeing from the Communist-dominated regime of Fidel Castro.

The first major contribution by a private corporation to Cuban relief, Texaco's grant will be divided among several agencies, according to Mr. Long. These agencies help provide funds for emergency aid, food, clothing, and shelter, and help obtain temporary employment for the estimated 30,000 to 40,000 Cubans who have sought refuge in Miami and in Tampa, New Orleans, and other Gulf Coast areas.

The Spanish Center, located in downtown Miami, has received $50,000 for relief work and to help provide schooling for Cuban children. The International Rescue Committee, which began emergency Cuban relief operations early in 1960, has received $25,000. The remainder is being divided among local organizations on the strength of recommendations made by the White House's personal representative in coordinating aid for Cuban refugees.

Mr. Long emphasized that, in spite of the seizure last June of more than $55 million of the Company's Cuban assets by the Castro regime, the contribution was made because Texaco conducted business in Cuba for more than 50 years and now wishes to help relieve the plight of those forced to flee the Island. Also, former Cuban employes of the Company now in the United States are being offered jobs in Texaco's domestic organization, or helped to find employment elsewhere.

Shortly after taking office, President Kennedy authorized a $4 million Federal relief program under a provision of the Mutual Security Act "to encourage the hopes and aspirations of peoples who have been enslaved by communism." This brings to $5 million the total granted by the Government, including the $1 million authorized by former President Eisenhower in December, 1960.

TEXACO EXECUTIVE ELECTED TO NICB

At a meeting of the National Industrial Conference Board in December, Texaco Vice President Stanley T. Crossland, who is in charge of Finance and Economics, was one of several New York business executives elected to serve one-year terms as regular members of the NICB.

Founded in 1916, the Conference Board is an independent, nonprofit institution for business and industrial fact finding through scientific research. The Board's facilities form a useful source of facts and figures bearing on many aspects of economic and business operations.

EDITORIAL PRAISES "MET" BROADCASTS

When Texaco began its 21st consecutive year as sponsor of the Metropolitan Opera broadcasts in December, *The Christian Science Monitor* took time to comment editorially on the Company's continued support of public service programming. In "Arias on the Air," the widely read daily said:

"Thousands of music lovers move expectantly to their seats. A brief burst of applause is heard. But the house lights don't dim. For the listeners are farm couples sitting in Nebraska parlors; a watchmaker conducting passages of *Trovatore* with loupe in hand; college coeds, heads Medusaed with curlers, picking up hints for the Saturday night dance from *La donna è mobile*.

"A new season has started for these diverse but loyal opera fans. Once again one of the most enlightened sponsors in American broadcasting . . . is admitting them free of charge to the Golden Horseshoe of the Metropolitan Opera House in New York.

"This marks the start of the third decade that Texaco has brought Bellini and Berg, Bjoerling and Bampton to a growing radio audience across North America. This season the sponsor deserves an extra *bravo*—if that's the way to applaud an oil company—for having taken the trouble to form its own radio network so that the opera broadcasts could reach all households 'live.'

"Earlier this year, when some stations of the regular network group showed signs of wishing to rerun tapes of the broadcasts at unpredictable hours, the sponsor simply strung together its own nationwide network of stations willing to hew to the Saturday afternoon live tradition.

"The spirit of the Medicis and Prince Esterhazy apparently lives on in the corporate offices of Texaco."

James V. C. Malcolmson

Howard S. McCray

EXECUTIVE CHANGES ANNOUNCED

The election of three new officers of Texaco Inc., as well as the election of a new President of The Texas Pipe Line Company—a wholly owned Texaco subsidiary—were recently announced.

Effective January 27, James V. C. Malcolmson, General Manager of Texaco's Marine Department, was named a Vice President of the Company.

Effective January 25, Howard S. McCray, formerly Assistant to the President of Texaco Inc., was named President of The Texas Pipe Line Company. He succeeds John W. Emison, who is retiring after 41 years of service.

Effective May 1, Wallace E. Avery will become Vice President in charge of the Company's West Coast operations, succeeding I. G. Morgan, who died on January 19. Mr. Avery has been Secretary of the Company since 1956. In his new position he will maintain headquarters at Los Angeles.

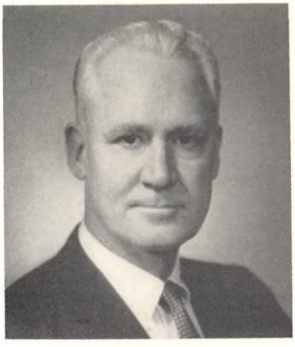
Also effective May 1 is the election of Maury L. Nee, presently Director of the Budget, as Texaco's Secretary, succeeding Mr. Avery.

Mr. Malcolmson joined Texaco's Marine Department in 1942, was appointed Assistant General Manager in 1952, and promoted to General Manager of the department in 1954.

In 1926, Mr. McCray joined Texaco as an engineer at the Company's Port Arthur (Texas) Plant. He was named as Manager of the Refining Department's Operations Division in 1954; and Manager of the Company's Purchasing Department the following year. He was appointed Assistant to Texaco's President in 1959.

Mr. Avery joined Texaco in 1945 as an attorney in the Los Angeles Office. In 1951 he was made Assistant General Manager of the Employe and Public Relations Department with headquarters in New York, and in 1954 became Assistant Secretary of the Company.

Mr. Nee joined Texaco in 1957 as an Executive Assistant in the Company's Finance and Economics Department. He was named Assistant to the Vice President in charge of Trinidad Operations a year later. In 1959 he became Director of the Budget for the Company.



Wallace E. Avery

Maury L. Nee

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C/S

SPHERES OF INFLUENCE—By an intriguing coincidence the storage tanks here, and the pipe lines feeding from them, look very much like the diagrams on the front cover come to life. The drawings on the front cover show molecular structures of several important basic formulations in petrochemistry. The photo above is of the Texas-U.S. Rubber plant (50 per cent-owned by Texaco) in the "Golden Crescent" of the Gulf Coast—an area now producing about four-fifths of this country's petrochemicals. Texaco's interests in today's petrochemicals industry is told in this issue, beginning on Page 5.