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A Monthly Summary of Economic and Business Conditions in Texas
By the Staff of the Bureau of Business Research, The University of Texas
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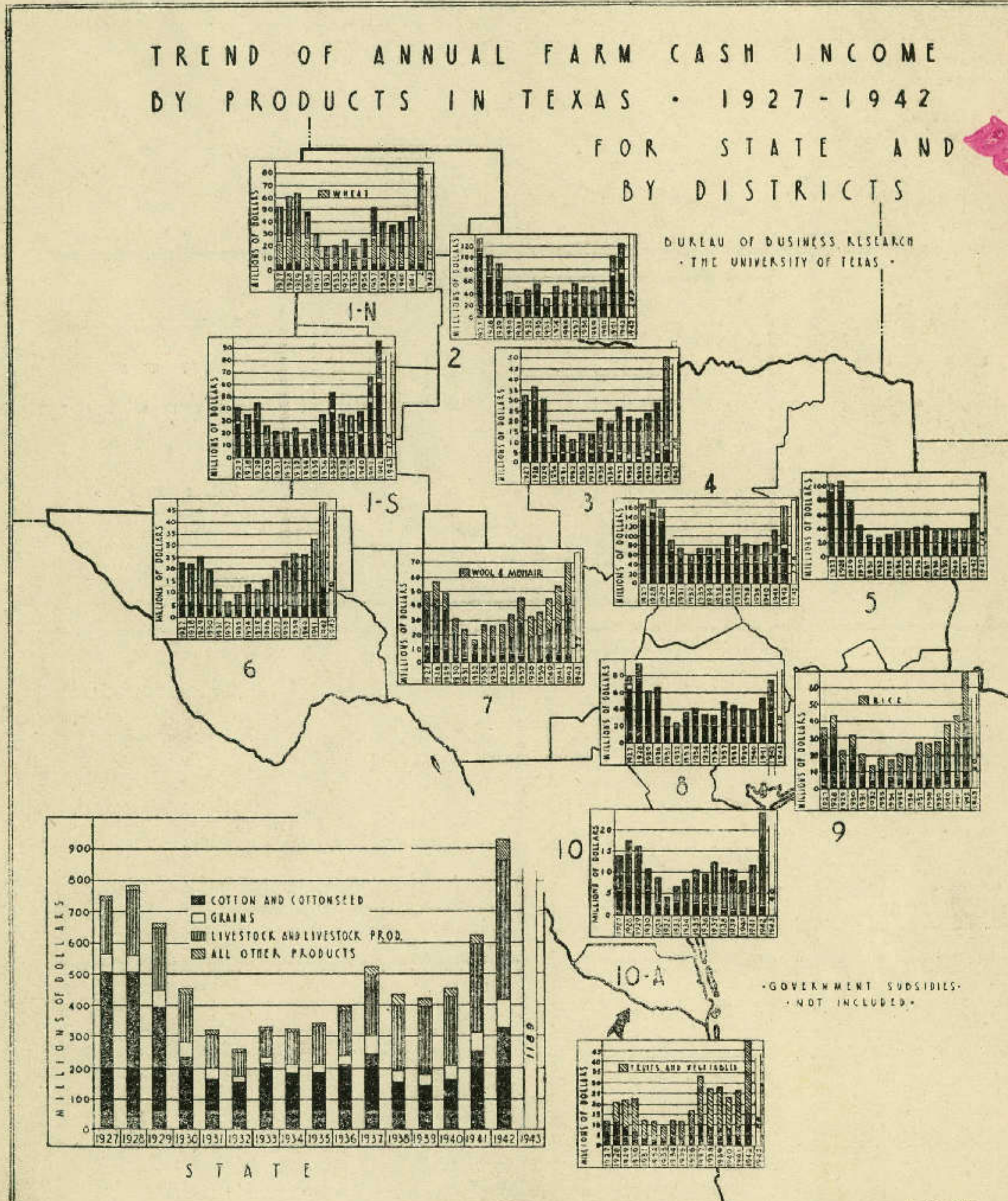

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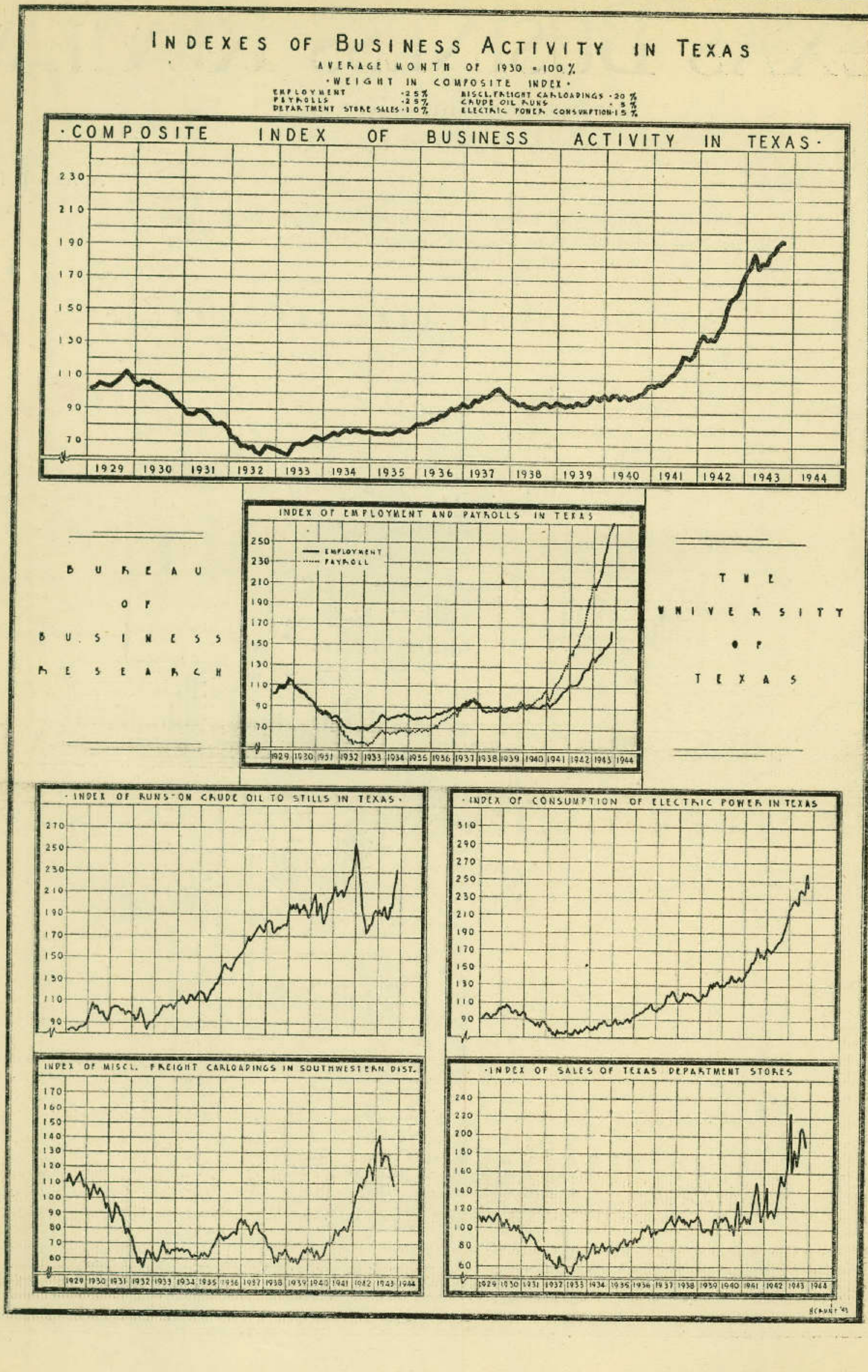
INDEXES OF BUSINESS ACTIVITY IN TEXAS
AVERAGE MONTH OF 1930 = 100%
WEIGHT IN COMPOSITE INDEX
EMPLOYMENT -25%
PAYROLLS -25%
DEPARTMENT STORE SALES -10%
MISCL. FREIGHT CARLOADINGS -20%
CRUDE OIL RUNS - 5%
ELECTRIC POWER CONSUMPTION -15%
COMPOSITE INDEX OF BUSINESS ACTIVITY IN TEXAS
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Business Review and Prospect

In marked contrast with the mental attitude which prevailed during World War I, there is in this country today great popular concern regarding our Post-war Economy. As ultimate military victory for the democracies becomes more and more certain and as the period shortens within which this objective will have been achieved, there is developing a mass psychology in which hope is mingled with fear over our economic future. The prolonged and deep economic depression of the 30's, which has become popularly associated with the dislocations caused by World War I, is no doubt contributing to this atmosphere of uncertainty. If, it is being asked, the relatively restricted sphere of intensive military operations of twenty-five years ago could bring in its wake the world-wide economic repercussions which occurred during the past decade, what may be expected from the present conflict which is now affecting every spot on the globe in a direct and vital way? It is entirely possible that the more thoughtful attitude of the people regarding post-war economic problems in contrast with the relative indifference concerning them which prevailed a generation ago under similar circumstances, may contribute substantially toward averting the thing which is now feared.

The term *inflation* has come to symbolize, among the rank and file of people, the economic dangers confronting us. This is a wholesome sign, although actually price inflation of commodities, except in the case of farm products, has advanced only moderately since 1939 in comparison with the similar period following the outbreak of the war in 1914.

As to the probable course of commodity price inflation during and following the war, much will depend upon the duration of the war and the policies adopted by private industry and the government. If the assumption is made, which is now quite commonly done, that the European phase of the war will end in 1944 and the Oriental phase, in 1945, dangerous inflation should be preventable. Among the factors which will contribute toward ameliorating inflation are: First, the increasing production of goods for civilian use as production for war purposes diminishes; second, equitable rationing of goods which are limited in supply; third, a high rate of taxation; fourth, the purchase of government bonds; fifth, payment of past debts and a low level of credit buying of consumer goods.

The first factor mentioned has the greatest potentialities for averting runaway inflation. Moreover, it is the one upon which our greatest hope must rest for a permanently better economy and better living standards for all. Nor is this hope without sound foundation. Developments of the past two years have demonstrated a production capacity in this country which was not believed possible before its actual accomplishment. A year ago it was generally predicted that the quantity of goods available for civilian consumption would be far less by this time than it has actually turned out to be. Dollar sales at retail for the current calendar year will be well above a year ago, a result it is true, of the rise in prices rather than an increase in physical volume of sales; yet the quantity of goods available for civilian use has been and is much greater than was anticipated a year ago. A portion of this increase has been at the expense of inventory but new production accounts for the bulk of it. This fact is all the more astonishing since only about thirty per cent of the country's industrial organization is being used for the production of civilian goods; the balance of our industrial capacity, or seventy per cent, being employed in the production of war goods. With such a huge potential capacity which will become available for the production of civilian goods after the war, the question may well be asked, as was done in the September issue of the REVIEW: Is there not a greater likelihood of post-war deflation than of inflation?

Further striking testimony as to the industrial achievement during the war is provided by a revision of the Federal Reserve Board's industrial production index, giving effect to new data on man hours of employment and to productivity per man hour. This revision raised the July index from 203 to 239 (1935–39=100) and established August and September at 242 and 243 respectively. In other words, the Board has concluded that instead of being double the pre-war level, production is nearly two and one-half times that level.

It has been well stated in a current publication that "The central task, recognized by all, is to establish a post-war economy which will require the employment of 56 million persons. All of them should be employed productively and those who do not contribute to a stockpile of goods and services will merely be contributing to inflation by receiving dollars which are not counterbalanced by things people can buy. For years the crying need of the country will be production—to absorb dollars—not only the wartime backlog of savings but also the new buying power generated by post-war employment itself. Government-sponsored public works can be either inflationary or non-inflationary, depending on their nature. In general, leaf-raking, mounment building and the like, contributing nothing to the country's material wealth, are inflationary and economically unjustified at a time when wealth as measured by dollars exceeds the supply of purchasable goods or services. On the other hand, such works as the building of needed roads, bridges, dams, and airports are counter-inflationary even if government-sponsored, because they tend to facilitate the movement of goods and thus enlarge the country's production capacity.

"In American life, the basic economic unit is the community. In the earlier stages of post-war planning, men talked as if post-war employment had to be instantaneous, on a nation-wide basis. Now there is less talk of dealing with the problem on a nation-wide basis and more of dealing with it on a community basis. Communities can list with reasonable certainty such factors as plant capacity, availability of materials, size of the manpower pool and housing. Most business men even can deal with the labor problem on a local, community basis, although of course, there are important exceptions to this rule."

Texas Business

Industry and trade in Texas during October maintained approximately the same level of activity as that which prevailed during the preceding month, but the rate of activity continued well above that of the corresponding period last year.

OCTOBER INDEXES OF BUSINESS ACTIVITY IN TEXAS

(Average Month of 1930=100%)

	Oct., 1943	Oct., 1942	Sept., 1943
Employment	160.3	132.1	155.8
Pay Rolls	271.8	200.4	265.1
Miscellaneous Freight Carloadings (Southwest District)	107.2	116.4	108.2
Runs of Crude Oil to Stills	232.4	191.7	224.6
Department Store Sales	184.3	145.1	193.2
Electric Power Consumption	241.7	220.2	258.0
COMPOSITE	195.8	163.4	196.1

Both employment and pay-roll indexes made sharp gains. The index of runs of crude oil to stills, adjusted for seasonal variation, also gained sharply, but the seasonally adjusted indexes of department store sales and electric power consumption were down. The October composite index remained virtually at the level of the preceding month.

Farm Cash Income

Cash income from agriculture in Texas during October, as computed by this Bureau, amounted to $162 million. This compares with $177 million during the corresponding month last year, or a decline of seven per cent. October was the only month during the current calendar year to make an unfavorable comparison with the corresponding month in 1942. Aggregate income, according to the Bureau's computations, for the first ten months of the year, totalled $890 million, which compares with $732 million during the corresponding period last year, a gain of nearly twenty-two per cent.

INDEXES OF AGRICULTURAL CASH INCOME IN TEXAS

(Average month of 1928–1932=100)

Districts	Oct., 1943	Sept., 1943	Oct., 1942	Computed Cash Income Cumulative January to November 1943	1942
1–N	251.6	213.5	143.7	94,164	71,553
1–S	377.1	536.4	330.1	79,488	59,510
2	148.5	147.7	235.7	85,188	93,472
3	168.4	207.5	202.1	40,874	40,404
4	138.7	111.8	155.8	155,687	140,916
5	102.7	81.8	124.8	74,545	52,047
6	172.4	232.9	216.3	38,393	31,095
7	127.7	138.9	143.8	61,152	60,575
8	141.4	135.5	154.6	97,065	73,540
9	244.4	194.2	217.5	70,760	50,299
10	244.6	160.7	264.6	28,191	17,702
10–A	271.0	69.4	399.8	64,302	40,795
STATE	173.2	129.0	189.5	889,809	731,908

NOTE: Farm cash income as computed by this Bureau understates actual farm cash income by from six to ten per cent. This situation results from the fact that means of securing complete local marketings, especially by truck, have not yet been fully developed. In addition, means have not yet been developed for computing cash income from all agricultural specialities of local importance in scattered areas throughout the State. This situation, however, does not impair the accuracy of the *indexes* to any appreciable extent.

The increase in the cash income during October, 1942, over that of the current year was the result mainly of larger income from the substantially heavier marketings of cotton a year ago. Income from cotton lint during October last year was $83 million against $66 million during the same month of the current year; while cottonseed brought in $3 million more a year ago. Prices of both seed and lint were above those of October a year ago but not enough higher to offset the decline in marketings. A decline in the marketing of cattle, calves, and sheep, with little if any advantage in price, also was a factor in the decline in cash income. Income from hogs showed an increase both as a result of larger marketings and higher prices; the same was true of poultry. Egg marketings declined moderately but were more than offset by a substantial increase in prices, resulting in a gain in cash income. The income from rice increased in spite of lower prices while that from milk and milk products and peanuts was above a year ago because of higher prices, marketings having fallen off substantially.

F. A. Buechel.

Natural Gas

A paper dealing with the facts and figures of natural gas—and such facts are relatively plentiful, and the figures large—might be important in bringing together in orderly form the apparently scattered threads that form the web of this industrial fabric; but it would miss the main points that are deserving of consideration—those points that are indicative of the potential position natural gas can achieve in our national economy. After all, the quantitative aspects pertaining to production and distribution in the natural gas industry, large as they are, and important as they are acknowledged to be, are but reflections of those qualitative features that are determinative in evaluating the economic aspects of the industry.

Nor can the natural gas industry be properly viewed if it is considered as being, *per se*, a self-contained industry; like other industries, natural gas is not only closely associated with other established industries such, for instance, in this case, as the oil industry, but, in a larger sense, it is to be viewed, in the United States, with reference to its relations to industry in general—to our economic life at large. This is to say, natural gas must be considered in its relations to the over-all economic and industrial picture of the nation as a whole.

The thing, however, that is so impressive about natural gas is concerned with the immensity of its potentialities, not from some visionary standpoint, but from the vantage-ground of facts pertaining to the actual developments already in progress, most of which have not as yet achieved their fuller expression in industry uses.

In the United States

Of all the countries of the world only the United States can be said to have a full-fledged natural gas industry, even of the conventional type. The steadily advancing position of this industry in the United States is well known in its larger outlines, but for various reasons the particular aspects of the industry, why they have developed as they have, the special place they occupy in the larger picture of industry and so on, are not so well known and therefore cannot be very fully appreciated.

No one questions the excellence of natural gas as a fuel, for heat and power uses. It is universally regarded as a superexcellent fuel for general as well as for special heating purposes; in addition, natural gas has come to be extensively used in the fields of metal heating and heat treating. Quoting from the article by Adams in *Chemical & Engineering News,* June 25, 1943: "Natural gas is used in fabricating aluminum, forging projectiles, forming glass, hardening armor plate, hardening cartridge cases, tempering instrument mechanisms, annealing bright steel, annealing gun turrets, heating rivets, melting soft metal, baking china in continuous ceramic kilns, drying foods, and in a wide variety of other heating operations." Its gaseous nature gives to natural gas not only a mobility not possessed by other fuels, whether as viewed as a fuel for domestic heating and cooking, or for its adaptability to long-distance pipeline transportation, but also renders it susceptible to close control in heating uses.

Rendering natural gas available in adequate volume to markets distant from the sources of supply made possible by pipeline transport is, in itself, of course, a remarkable industrial achievement. Nor have these things just happened; they have required a marshaling of factors and conditions so as to bring about an organization that is highly efficient in making the natural gas from fields far removed from centers of consumption readily accessible to these markets. In these accomplishments, technologic advances have had their place, too, as exemplified in techniques not only in manufacturing suitable pipe for the transport lines, but also in laying the pipe as well as in equipment for facilitating the effective flow of natural gas once the lines are opened.

The mutual association of petroleum and natural gas is also known in a general way, and the utilization of natural gas in efficient oil production has become rather common knowledge during the past decade or so; the inherent features of this association that have proven so fundamentally significant are not, however, as well appreciated as they might well be. As Wallace Pratt has written in "Oil in the Earth": "While we search for oil fields and record our discoveries in terms of barrels of oil, what we really find is gas, with which is associated a subordinate quantity of oil. The search for oil in the United States over the last ten years has brought to light greater reserves of energy in the form of gas than in the form of oil. The gaseous component of our recent discoveries of oil in the earth exceeds the liquid not only in volume, but in actual weight and, therefore, in the total horsepower or the total calorific value made available to society. We seek oil because we have learned to utilize oil for a variety of purposes and have adapted our economy and technique to its use: oil lends itself readily to storage and transportation at low cost and without waste. We are less keenly interested in gas because we have not as yet found needs for it as compelling as our needs for oil and to convert gas into the liquid state convenient for wide use is difficult and expensive. But what we really find in our search is gas rather than oil."

In this connection, too, the contrasts already evident in the comparative data as to our oil reserves as distinguished from our natural gas reserves are worthy of considerable emphasis, especially at this particular time.

As to oil, the falling rate of discoveries of reserves is occasioning considerable anxiety. As concisely summarized in the *Industrial Bulletin* of Arthur D. Little, Inc., October, 1943:

> Petroleum has been so cheap and plentiful in the United States and its use has become a characteristic both of Americans and American industry. Nevertheless, trends in action since the mid-thirties indicate that the rate of finding new oil falls far short of our consumption and that we are consequently drawing on our reserves. Unless these trends are reversed our prospects are for more expensive oil, partially imported, for more careful use, and ultimately for liquid fuels from non-petroleum sources such as coal and tar sands.
>
> During 1934 to 1938, new oil reserves were discovered at the average rate of 2,000 million barrels per year. During this period the size of the average new field decreased from 19.7 million

barrels to 11.4 million barrels, but the increased number of fields found maintained the rate of total discovery. After 1937, however, the rate of new discoveries decreased markedly, from somewhat over 900 million barrels of ultimately producible oil found in that year to 400 million found in 1941 and 250 million in 1942. During this period the size of new fields continued to decline, from 5.6 million barrels in 1939 to 1.2 in 1942, and greater numbers of new fields, to maintain the rate of discoveries at the level of the early thirties, could not be found. Most of the decline in rate of discovery came before the war imposed difficulties on random exploratory drilling.

Current Discoveries

The current rate of discovery, 250 million barrels in 1942, compares with a prewar consumption rate of about 1,250 million barrels per year and a current wartime rate of 1,400 million barrels. Even today's restricted civilian consumption is greater than the rate of new discoveries. Except for a few locations, every field in the nation [with few exceptions] is now producing at or in excess of its maximum efficient capacity and must continue to do so to meet wartime demand. Estimates of our present petroleum reserves are based on the assumption of a production rate below these maxima. It is feared damage caused by this overproduction may offset any possible upward revision in our reserves based on more precise knowledge of established fields.

Estimation of our ultimate oil supplies is a controversial question, since some big new discovery often vitiates predictions based on past statistics. However, the more oil is discovered, the less is left for discovery; and since the total amount available is fixed, within the human scale of time, the limits of discovery in the nature of things will inevitably be reached at some time.

The falling rate of discoveries is due to the growing difficulty of finding new geologic traps for oil. Obvious and easily mapped structures have been drilled and most of the shallow prospects have been tested by drilling. The remaining undiscovered reserves are thus largely either in regions not yet explored because of unpromising prospects, in reservoirs deeper than those already reached in producing structure, or in reservoirs without surface or geophysically detected identification. In the ultimate sense only those regions composed entirely of the underlying igneous rock formations can be considered without prospect of having oil, but in a practical sense there are other limitations. Even the most unpromising of possible regions has had some exploration in recent years.

Another appropriate statement of the problem in perspective is the summary of Frolich's recent address before the American Chemical Society occurring in *Industrial and Engineering Chemistry,* November, 1943. This statement is as follows:

> Our growing dependence on the products of the oil industry has resulted in considerable concern regarding the ability to supply our future needs for liquid hydrocarbons. The proved reserves of crude oil correspond to fifteen years' consumption at the prewar rate. However, the excessive wartime requirements for petroleum have led to such a high rate of withdrawal from these underground reservoirs that we may not be able to keep up with the demands for long. In addition to the proved reserves of petroleum known to be present in the earth, large but as yet undiscovered petroleum resources may be expected to exist in various parts of the world. How long we can continue to find this oil and bring it to the surface at the desired rate is a question, but it is certain that eventually a shortage in natural petroleum will occur. When that time comes, it should be possible to supply our needs for gasoline and other hydrocarbon products from such alternate sources as natural gas, shale oil, and coal. It is concluded that there need be no sudden change as far as the supply and consumption of gasoline and other petroleum derivatives are concerned. Future developments in this field will probably be characterized by further technological progress, increased drilling for oil on a world-wide basis, necessary adjustments in supply and demand, and a gradual shift to synthetically produced hydrocarbons.

A great deal of attention is currently being devoted to the petroleum situation. Until a short while ago we were primarily concerned with the transportation problem. The question of getting available petroleum products to where they were needed seemed to overshadow all other considerations. Now that the transportation difficulties gradually are being overcome, our interest in turning to the question of the country's ability to produce crude oil to supply the present and future demands for petroleum products.

In regard to natural gas reserves, although the ultimate total of these in the United States is much more speculative than is the case for oil reserves, the following quotation from an article by Ralph E. Davis in *The Oil and Gas Journal,* October 8, 1942, is indeed pertinent to the larger aspects of the problem:

> The known reserves [of natural gas] today are greater than in the previous year. This statement is based upon the fact that in every recent year very substantial additions to the known natural-gas reserves have been madeand in amounts annually exceeding the total gas withdrawals. For example, within the last 2 or 3 years very notable discoveries of large reservoirs filled with gas at very high pressure have been found along the Wilcox trend in a belt that crosses South-Central Louisiana and South Texas, and exploration along this trend is in an early stage. Deep drilling along the Gulf coastal plain in both South Louisiana and in Texas has added enormously to known reserves within the past 5 to 10 years. In the region of the Sabine uplift proven reserves today are substantially greater than were known in 1930. No one familiar with this development will deny that known gas reserves of the nation have been climbing from year to year and at a substantial rate.

Source Regions of Natural Gas

The sequence in the commercial development of natural gas producing regions of the United States has paralleled rather closely that exemplified in oil production. In both cases the vast regional shifts from the Appalachian district across the Mid-West into the Gulf Southwest and California are outstanding performances. It is, of course, a well-recognized fact that the truly large concentrations of either oil or natural gas reserves are limited to only a few areas.

Also, in the case of both oil and gas, one result of these geographic shifts in production was the opening up of the truly large reserves of oil and gas in regions distant from the large centers of consumption; on the other hand, the rise of large oil production in these new regions has had a remarkable effect upon the stimulation of regional industrial development—that is, large oil production greatly aided the geographic dispersion of industry into these regions that now have become so outstanding in oil and gas resources.

The nucleii of these new industry developments initially centered about oil refining enterprises; in the meantime, the oil refining industry itself has steadily climbed to a high position among the manufacturing industries of this country.

Industrial growth and concentration of urban population in turn provided expanded regional markets for the growing volumes of natural gas that were being made available. What is quite apparent is that oil and gas resources have been basic to the changing regional economy particularly of California and of Texas as well as the other states of the Gulf Southwest. Unquestionably, these are not only basic natural resources as regards the economic development of these regions, but also they are to be regarded as essentials upon which further industrial development in these regions will largely be based. California, for instance, is a large producer of natural gas but none is transported out of that State. On the other hand, the Gulf Southwest, although now a large consumer of natural gas, ships vast quantities to other sections of the country by way of large transcontinental pipelines, most of which have been laid since the middle 1920's. In fact, the great stimulus for this transport of gas came with the discovery of the gigantic Panhandle gas field, with it possibilities for large production on a scale never before witnessed anywhere. Since the opening of this enormous field in the middle 1920's other large reserves have been added to the Texas total.

The major proportion of the derivatives from the Texas oil industry is sold outside Texas; but the Texas oil refining industry processes a large part of Texas crude oil production, and Texas therefore benefits from these refining operations. Natural gas, on the other hand, ordinarily requires nothing so elaborate or complicated as the oil refining industry to render it available for conventional uses as a fuel.

Total volume of natural gas delivered to consumers in the United States from 1906 to 1941 inclusive has been placed by the Bureau of Mines at slightly more than 45 trillion cubic feet. To this total amount perhaps at least as much as 25 per cent should be added for gas lost and wasted. Data are not available as to the amount of gas produced or lost and wasted prior to 1906. Ralph Davis has estimated that the grand total of natural gas produced, lost, and wasted in the United States to date is in excess of 65 trillion cubic feet.

East of the Mississippi

The Appalachian district parts of New York State, Pennsylvania, Ohio, Kentucky, and most of West Virginia) is the oldest gas producing district of the United States. Its total production of gas marketed, but not including the loss and waste, from 1906 to 1941, is, according to Bureau of Mines data, in excess of 13 trillion cubic feet. The comparable national figure, a little more than 45 trillion cubic feet, is 3.5 times that of the Appalachian district. The marketed production of this district in 1941 was 422 billion cubic feet, or 14.5 per cent of the total national output for that year.

From the standpoint of its position in annual production, in relation to the national output, the future of the Appalachian district lies in the past. As regards the regional importance of the district, the annual production is very important indeed, as attested by the exploration programs that have been instituted there, particularly in the search for the Oriskany sand sheet, which gives deep gas production in eastern portions of the region.

The main point, however, from the standpoint of national perspective, the Appalachian district is becoming a deficit region, and just at a time when its chemical industry is demanding larger supplies of natural gas hydrocarbons.

This is a region in which natural gas commands a high price. In 1941, according to the Bureau of Mines, the average value of gas at wells in West Virginia, the main producing State of the district, was 12.1 cents a million cubic feet; this, of course, is in great contrast with Texas, the main producing State of the nation, for which the comparable figure was 2 cents a million cubic feet. In Pennsylvania, the comparable figure was 21.5 cents, and in New York State, 19.6 cents.

The average value of West Virginia gas at points of consumption was 39.5 cents a million cubic feet, in contrast with the comparable figure for Texas of 14.9 cents. The comparable figure for New York State was 75.1 cents.

The North-central district (Indiana, Michigan, and Illinois) is a minor one in the national picture at large, from the standpoint of both production and reserves; although locally important, production is minor in relation to the market demands of this district.

The Rocky Mountain States, although a minor district in the national picture, has greater reserves than the North-central district and also the reserves of the Rocky Mountain States are fairly high, not in relation to the national market but as regards the region's market requirements.

California

California neither imports nor exports natural gas. In California, natural gas production has always been closely related to oil production; much of the natural gas has come from gas-caps in the oil fields. It should be noted that California has rather strict conservation laws regulating natural gas—a reflection of the high place natural gas occupies in the regional economy of the State. In 1941, California produced 375 billion cubic feet of marketable natural gas. Ralph Davis places California's recoverable natural gas reserves at from 9 to 10 trillion cubic feet.

The Gulf Southwest or the Mid-Continent–Gulf Coast Districts

The Gulf Southwest as here used includes Texas, Louisiana, Arkansas, Oklahoma, Kansas, and eastern New Mexico. This large region is admitted by all to be *the* great storehouse of natural gas reserves of the United States.

Estimates of natural gas reserves vary; the need of much better estimates than we have is admitted by all. But in the over-all picture for the nation at large and for the Gulf Southwest as a whole, the estimates of proven recoverable reserves do not vary greatly. Those given by Ralph Davis in *The Oil & Gas Journal* of October 6, 1942, will be used in this paper as representing a general consensus of opinion.

Davis places the total proven recoverable reserves of natural gas in the United States at 85 trillion cubic feet. According to Davis, the total proven reserves outside the Gulf Southwest add up to nearly 16 trillion cubic feet. This leaves for the Gulf Southwest at large the amount of nearly 70 trillion cubic feet as proven reserves, according to Davis' data. Thus the Gulf Southwest has more than 80 per cent of the nation's total known reserves of recoverable natural gas, on the basis of what are regarded as conservative figures.

As to potential reserves of the United States, over and above the actual proven reserves, Davis tentatively placed the volume at around 85 trillion cubic feet, a figure quantitatively equal to the proven recoverable reserves of the nation as a whole.

But as the potential reserves of the Appalachian and North-central districts, together with the Rocky Mountain states, are considered as relatively small in magnitude and those of California being as yet an open question, this leaves the bulk of potential reserves of the nation in the Gulf Southwest.

Summarizing Davis' conclusions as to the Gulf Southwest, the following items appear as outstanding:

1. Eastern Kansas and northeastern Oklahoma, being older producing areas, have largely depleted their gas reserves.

2. Reserves of 1 trillion cubic feet, or more, are considered as proven in southern and southwestern Oklahoma. "There can be no doubt that additional substantial gas reserves will eventually be found in western and southwestern Oklahoma. Here the producing formations lie at great depth, exploration will be expensive and once the search for oil in the region proves to be satisfactory the ultimate discovery and development of the potential supplies of this region will doubtless involve a long-time period."

2. The Amarillo and Hugoton gas fields, situated in the Texas Panhandle, in southwestern Kansas and the Oklahoma Panhandle have enormous gas reserves. As a matter of record, it should be stated that the discovery well in the Texas Panhandle was one that was put down in search for oil; this was in 1918, resulting in the discovery of a 15-million cubic foot gas well. Three years later oil was found in another location. It was not until 1925 and 1926 that the large proportions of the Amerillo field began to be realized. Davis places the total proven reserves of the Panhandle and Hugoton fields at more than 30 trillion cubic feet; this is regarded as a conservative figure, as the fields are only partially developed. Concerning the ultimate reserves of the fields, Davis has written: "My guess is that with the passage of time natural gas will become more valuable and we will find it economical to withdraw gas from reservoirs such as Hugoton and Amarillo even when the productive capacity of wells has declined below that which today would be economic. These large reserves now recognized as proven but classed as nonrecoverable may become recoverable. Such reserves are potentially recoverable just as are the known reserves of iron ore which because of their grade cannot be economically mined today. . . ."

4. The gas fields of North and Central Texas are widely scattered; Davis places the proven recoverable reserves at from 2 to 3 trillion cubic feet.

5. The Permian Basin of West Texas and southwestern New Mexico has proven reserves of 4 to 5 trillion cubic feet. In regard to this district as a whole Davis comments as follows: "The market demand for gas from this area has been so limited that careful over-all studies of the region have not been made so far as I know. Nevertheless, we are aware of the great extent of natural gas, much of it in producing formations that have been cased off in wells reaching deeper for oil."

6. The Sabine Uplift district is an oil and gas producing area embracing northwest Louisiana, southwest Arkansas and adjacent northeast Texas. Davis places the proven recoverable portions of gas reserves of this district at 3 trillion cubic feet.

The Sabine Uplift district does not include the Monroe gas field of north-central Louisiana, which has produced more than 3 trillion cubic feet and has a remaining recoverable reserve estimated at 2 trillion cubic feet.

7. The Gulf Coastal Plain currently deserves more consideration apparently than any of the other gas producing districts. With respect to natural gas, Davis has summarized this region as follows: "The Gulf Coastal Plain is the storehouse of our natural gas reserves, both proven and potential. The presently known recoverable gas reserves of the Gulf Coastal Plain west of the Mississippi and north of the Rio Grande are, in my judgment, 25 trillion cubic feet. This estimate does not include several trillion cubic feet of gas dissolved in oil and currently making slight contribution to the used-gas supply of the region. The potentialities in this region are great. Many new fields have been found in every recent year and in spite of the fact that new oil reserves are becoming increasingly difficult to discover there is no indication that we will have any early difficulty in adding to our known gas reserves whenever it may be worth while to do so. It is recognized that the deeper formations of the Gulf Coastal Plain are relatively rich in gas and condensate as compared to petroleum. We may expect the future to bring forth many additional producing areas and that deeper drilling in presently productive areas will, if the economics justify, discover new reserves of the order of at least the quantity now known."

General View of the Natural Gas Situation in the Gulf Southwest

1. The total marketed gas production of this large territory 1906 to 1941 inclusive, according to Bureau of Mines data, amounted to 24.7 trillion cubic feet. There was marketed production prior to 1906; and furthermore, no one knows how much gas has been lost and wasted in this province.

2. Davis puts the proven recoverable gas reserves of this area at 70 trillion cubic feet. As to the potential reserves, Davis concludes: "The potentialities of the region for additional gas not now actually known may, if you like, be anybody's guess. . . . If gas reserves of this category ["large reserves now recognized as proven but classed as nonrecoverable . . ."] can be included as potential, then I would guess the ultimate reserves of the Mid-Continent–Gulf Coastal region to be of an order approaching the presently proven recoverable reserves. . . . With wastage now under substantial control and with greater control expected for the future it seems to me reasonable to expect a future marketable production of the order I have suggested."

3. As to Texas, the total marketed production in 1941 of natural gas in this State, according to the Bureau of Mines was 1,086 billion cubic feet. Texas in that year exported, in round numbers 257.3 billion cubic feet and imported 46.6 billion, thus giving a net export of 211.7 billion cubic feet. This amount subtracted from the total of 1,086 billion leaves 874.6 billion as the amount consumed in Texas in 1941. Of this State total, 540 billion cubic feet were used for industrial purposes, including that consumed in petroleum refineries and electric public-utility power plants. The industrial uses of gas in Texas therefore account for 50 per cent of the marketed gas produced in the State. This suggests, on the face of it, from a consideration of merely volume alone, that industrial uses of natural gas are already far more important in the economy of the State than is generally recognized.

Data when available for 1942 will no doubt show increases over these various figures for 1941.

4. Finally, there is the practically all embracing problem as to the industrial possibilities of Texas as based on its natural gas resources. Industrial uses for natural gas in Texas, other than for carbon black, have been mainly as fuels—for heating and power purposes. The production of natural gasoline and other liquefied hydrocarbons—the so-called liquefied petroleum gases—has grown into a considerable industry in recent years; this trend has, of course, been greatly intensified as a result of the war effort.

The quantitative aspects of gas for fuel in the State were noted briefly in the preceding section. Uses of natural gas as an industrial fuel, in reference to various industries dependent upon it, were briefly considered in an article in the TEXAS BUSINESS REVIEW for January, 1943.

The qualitative aspects of natural gas as an industrial fuel, however, appear to be of even greater importance in Texas than the quantitative volumes so used seem to indicate.

Another qualitative feature of great potential importance in any evaluation of the natural gas resources of Texas is that concerned with the widening uses of natural gas and its several components as raw materials for chemical manufacturing.

CHEMICAL CONVERSION OF NATURAL GAS

Natural gas is an inflammable gas which occurs in porous rocks of the subsurface, the gas accumulations being capped by impervious strata. Like oil pools, natural gas accumulations are evanescent features in the geologic history of the earth's crust.

Chemically, natural gas is composed of hydrocarbons of the paraffin series. The primary hydrocarbons of natural gas are methane, ethane, propane, and butane, but also there are others, such as pentanes, hexanes, and heptanes. In addition, helium, carbon dioxide, and nitrogen are sometimes present. So-called "sour gas" contains hydrogen sulphide and organic sulphur compounds.

In sum, natural gas may be designated as a complex mixture of compounds of carbon and hydrogen; these compounds mostly include methane and ethane as well as propane, butanes, pentanes, hexanes, and so on.

Commercial natural gas, mainly methane, is a mixture of methane and some ethane, which on the average comprises 90 to 95 per cent of the original content of natural gas as it occurs in geologic formations. For long-distance transportation the hydrocarbon compounds other than methane are largely extracted in order to facilitate the transmission of the gas in pipelines. These extracted hydrocarbons (propane, butane, pentane, etc.) are natural gas ingredients around which so many new developments have been built—such as a wide list of organic chemicals, solvents, explosives, synthetic rubber, and high-octane gasolines.

In brief, chemical conversion of natural gas hydrocarbons gives to natural gas a much higher field of utilization than is afforded by its conventional uses as a fuel or in specialized heat treatment of metals and the like.

For practical purposes gas fields may be classified into three categories:

(1) Dry gas fields in which the gas is not associated with either oil or distillate;

(2) Casinghead fields in which gas is produced with oil;

(3) Distillate or condensate fields in which the heavier hydrocarbons are recovered through recycling operations and the merchantable gas is returned to the producing geologic formation. K. S. Adams, President of Phillips Petroleum Company, emphasizes the importance of this latter gas in stating that it will "make up a large portion of our supply in the distant future."

In brief, the natural gas industry has been concerned primarily with what is designated as "high-line" natural gas, for use as fuel. This phase has constituted the bulk of commercial developments characteristic of the natural gas industry.

More recently, however, the rise of chemical derivatives from natural gas has begun to broaden the fields of natural gas utilization at large, and has stimulated considerable interest in what are universally regarded as vast potentialities which natural gas possesses as bases for great chemical developments. It is hardly necessary to add that the growth in these newer fields has been greatly accentuated by technologic advances in newer phases of hydrocarbon chemistry. The important fact to emphasize here is that natural gas is a veritable storehouse of compounds and derivatives that are of profound importance in our national life; they are sources of supply of vital materials in war and in peace. In fact, the diversity of processes applied to these numerous hydrocarbon groups result in the production of a bewildering array of intermediates and resulting products.

These newer developments pertaining to chemical conversion applied to natural gas are of two main groups:

1. Those that convert these hydrocarbons into liquid fuels, the properties of which are superior to natural or thermally cracked liquid fuels.

2. Those that convert these hydrocarbons by chemical synthesis into other lines of products, those generally classed as synthetic organic chemicals.

Conversion to Liquid Fuels

Hydrocarbon compounds such as ethane, propane, butane, and pentane are found in appreciable percentages in natural gas; these are the compounds ordinarily extracted from natural gas in processing it for transmission purposes. These gases are also present in residual gases from oil refineries, as by-products of cracking operations; in this latter case these hydrocarbons of the paraffin series are associated with the corresponding olefin (unsaturated) hydrocarbon compounds—and these latter have long been recognized as especially desirable for purposes of chemical syntheses, but which until recently have been to a great extent consumed in what is designated as low-value utilization.

However, the processes by which these gases are converted to liquid fuels are quite complex—involving such complex operations as thermal cracking, dehydrogenation, polymerization, hydrogenation, alkylation, and isomerization.

In line with Adams' summary, the following statements are pertinent to the situation at large:

(a) Low-pressure pyrolysis (thermal cracking) applied to these gas compounds, which was the earliest of processes used in this line of development, demonstrated that such aromatics as benzene, toluene, and zylenes, as well as heavier aromatics could be produced from natural gas. Formerly, the production of these aromatic compounds was limited to their derivation from coal-tar products.

In addition to these aromatics, this process, described as an extremely versatile one, can be used to produce olefin hydrocarbons, which are valuable indeed in the synthesis of organic chemicals. One of these olefins, ethylene, is widely used for the manufacture of such substances as tetraethyl lead, neohexane, industrial alcohol, and ethyl benzene. Ethel benzene is especially important for the production of styrene, which besides its uses as a raw material in making polystyrene plastics, is now an important intermediate in making Buna-S rubber. Higher olefins, similarly produced, are exceedingly important in supplying raw materials for aviation gasoline and butadiene, the latter being the major intermediate for Buna-S.

(b) High-pressure pyrolysis of natural gases was used to produce premium gasoline from these gases which previously had been largely wasted. In the prewar period it is said that some 30 per cent of the available butane was being processed by these methods, giving an annual output of some 15 million barrels of high quality gasoline.

(c) Then in what has been called the "race for octanes" polymerization, hydrogenation, and dehydrogenatio ncame to be used for the manufacture of isooctane and other high-octane constituents of motor fuels.

(d) Later came the application through alkylation of a discovery made some years ago that the proverbially inert paraffin hydrocarbons could be made to react with hydrocarbons of the olefin series to give a saturated product—alkylate, which is now strategically important in providing blending agents for high-octane aviation fuel. Concerning the military importance of this product, Adams states: "It is to this chemical reaction of paraffin alkylation, a tool which has many unexplored applications in the field of chemistry, that the United Nations owe their present superiority over the Axis nations in aviation fuels."

(e) Normal butane is ordinarily plentiful; but it is isobutane that is required in producing alkylate. As a result, the process of catalytic isomerization has become important in converting normal butane into isobutane, thus supplying the required raw materials for making isooctane or other high-octane blending agents. By isomerization the molecular structure of normal butane is rearranged into the isomeric compound, isobutane.

Adams concludes as follows: "The volumes of selected fuels and selected fuel ingredients currently being produced is, of course, a military secret. We know that the volumes are large and that new facilities are constantly being created to make still larger volumes. No one can risk a guess as to what these fuels will make possible in the way of new pleasure cars and commercial aircraft for the simple reason that the same technological revolution is going on in other industries. Along with new light metal alloys and new plastic materials of construction, the effect of fuel quality will be only one of the items which will cause us to scrap our prewar models of cars and aircraft."

Natural Gas and the Chemical Industry

Historically considered, the use of hydrocarbons on a large scale as chemical raw materials had its beginnings in Germany in the latter quarter of the 19th century. The rise of the organic chemical industry in Germany was based on the use of coal tar products—which in turn were by-products of the coking industry that was expanding rapidly in that country along with the growth of the German iron and steel industry.

World War I brought to the United States, as well as Great Britain, the sudden, almost tragic realization that neither of these countries had very much in the way of organic chemicals industry; for these products, both countries had been dependent upon Germany. A consequence of this situation was the building up of an organic chemicals industry in the United States, which continued to expand substantially in the post-war period. This industry, like that of Germany, was built largely around coal-tar products. As a result of this growth in the Unifed States, Germany lost the large share of the American market for those organic chemicals in which it formerly had held a practical monopoly.

World War I also stimulated a strong interest in petroleum which assumed, during that period and later, vital importance as a strategic commodity. Emphasis, however, was placed, and naturally so, upon the bulk production of conventional products from petroleum, which was tremendously stimulated by the almost spectacular growth of the American automobile industry during the two decades following World War I. During this period, however, there was developed a wide interest in research dealing with hydrocarbons readily supplied in such vast quantities by petroleum.

The net result was that tremendous strides were made in science and technology pertaining to the hydrocarbon components of petroleum, evidenced in part by the fact that today's newspaper vocabulary embraces such terms as polymerization, alkylation, isomerization, catalytic cracking and so on—words which a decade ago were hardly heard outside laboratories.

Since World War I, natural gas has risen to the status of an important American industry. Natural gas, like petroleum, is also a huge reservoir of hydrocarbons as previously stated and many of the techniques worked out in dealing with petroleum hydrocarbons and their derivatives, particularly those dealing with oil refinery gases, are applicable also to natural gas.

The war effort naturally has given a tremendous impetus to the chemical conversion of natural gas hydrocarbons just as it has for those derived from petroleum.

Natural gas, for instance, as a part of the war program, is being subjected to thermal cracking processes to yield hydrogen, which is reacted with nitrogen from the air to produce ammonia. Ammonia can be readily oxidized to give nitric acid, which combined with toluene forms TNT. Ammonia reacted with nitric acid yields ammonium nitrate, valuable either as a base for explosives or for fertilizer. Ammonia reacted with picric acid yields ammonium picrate, a high explosive called Lyddite. This, however, does not exhaust the list of explosives derivable from natural gas. Egloff, writing in the *National Petroleum News*, October 28, 1943, stated: "One explosive considered the most powerful of all is tetranitromethane made when nitrating natural gas. In fact, natural gas may well develop into one of the most valuable explosive sources known due to the nitro paraffins, which have not been exploited as greatly as the nitrated products of the aromatic hydrocarbons. Methane when nitrated can take on as many as four nitro groups. This product is a very high explosive and the most destructive known to man."

The possibilities of natural gas constituents in providing raw materials for plastics merit thorough consideration. Egloff has briefly but aptly summarized this situation as follows: "We may expect that before many years the urge and drive inside the oil industry will build up many new types of resins or cheaper ones than are now on the market.

"The raw materials from natural gas are available to produce phenol and formaldehyde. One commercial plant at least produces formaldehyde and methanol. The process is simple. It is just straight oxidation that converts methane and ethane into formaldehyde, methanol, acetic acid, and acetaldehyde. The phenol that was previously mentioned is combined with formaldehyde, and a Bakelite type of resin is the resulting product."

Butane, a constituent of natural gas, is a basic material for butadiene, chief intermediate for Buna-S rubber. The isomerization of butane to isobutane has been mentioned. Conversion of natural gas paraffin hydrocarbons to the corresponding olefins, either by processes involving high temperatures or catalytic reactions, provides basic materials for a wide range of resins and plastics, and the synthetic rubbers as well. The olefinic compounds comprising ethylene, propylene, and butylenes are starting materials for a wide range of synthetics. These hydrocarbons are now in great demand for the production of aviation gasolines and for the synthetic rubber program as well.

Ethylene, the simplest of the olefins, is used to alkylate isobutane to give neohexane, an important hydrocarbon ingredient for aviation gasoline. Ethylene is also important, as mentioned elsewhere, to produce ethyl benzene by alkylation of benzene.

Propylene alkylated with benzene gives cumene, an important aviation gas component. It should be noted that two natural gas components, normal hexane and heptane, both of which are low in octane ratings can be changed in structural configuration and in properties by catalytic processes into aromatic hydrocarbons. Hexane, a straight-chain hydrocarbon can be cyclicized to benzene.

Shell Development Company has developed a process in which propane or propylene are chlorinated and then hydrolized to glycerine. Because of its use in making explosives such as trinitroglycerine, glycerine has become a strategic material.

Concerning the production of organic chemicals from basic hydrocarbons, R. D. Stratford, Chief Research Chemist, Imperial Oil Limited, has recently summarized in *Chemical Industries*, October, 1943, the situation as follows:

> It is well known that methane can be reduced to carbon monoxide and hydrogen, which can then be recombined to form methyl alcohol. By further oxidation methyl alcohol can be converted into formaldehyde, an important component of the phenol-formaldehyde type of plastics. While sufficient methane could be obtained from refinery gases for the manufacture of a large quantity of formaldehyde, a more probable source is natural gas. This occurs in great quantities in many parts of the country and consists for the most part of methane.
>
> The potential number of chemicals using ethylene as a basic substance amounts to many thousands. . . . By such processes as alkylation chlorination, sulfonation, and nitration, ethylene is converted into organic chemicals, such as styrene, ethylene glycol, ethyl alcohol and acetic acid. Many of the products so formed are used in the manufacture of synthetic resins, rubber and plastics. . . . By essentially the same methods as are used for ethylene, propylene may be converted to such products as acetone, glycerine, cumene, and others, which are used in a variety of materials ranging from cosmetics to explosives.
>
> For several years the butylenes have been used in the manufacture of aviation alkylate, the synthetic fuel added to aviation gasolines to increase their octane number. The chief component of aviation alkylate is iso-octane, a hydrocarbon which only a few years ago cost $25.00 a gallon. As an indication of the economic significance of large scale production chemicals from petroleum, the cost of iso-octane today is less than 50 cents a gallon.
>
> Until the Japanese took control of this continent's chief sources of natural rubber, butylenes were used as a component of motor gasoline and in the manufacture of iso-octane and butyl alcohols. Now they are the chief source of synthetic rubbers. Buna–S synthetic rubber requires butylene as a basic raw material while Butyl synthetic utilizes isobutylene.

Acetylene is another hydrocarbon of no small importance, actually or potentially. Egloff, in the article already referred to, comments on acetylene as follows:

> It is likely the future will see the elimination of the calcium carbide method of making acetylene in electric furnaces from lime and coal, based on the competition of low cost hydrocarbons from natural gas or petroleum. We now have a method of making acetylene thermally and two commercial units are being installed, one of which will produce 75 tons of acetylene a day.

The charging stock can be either propane from natural gas, or light ends of natural gas or other fractions from petroleum.

It is believed this method will produce acetylene at a lower overall cost than by the electric furnace [calcium carbide] method. The natural gas industry has the quantities of propane necessary to supply our entire needs for acetylene. Acetylene has many commercial uses. Germany makes it from calcium carbide and then converts it into a series of chemical products, winding up with butadiene. Acetylene is the base material from which is produced the butadiene for Germany's Buna-S rubber, Nylon is also produced from acetylene as a base.

Acelylene is a raw material for the production of certain synthetic resins and plastics materials, such as the vinyl resins and the vinylidene chloride resins. The newer commercial method of producing glacial acetic acid is from acetylene. Acetic acid is used, for example, in the preparation of cellulose acetate, as well as for polyvinyl acetate.

It is appropriate to note that the electrical discharge process developed by Dr. E. P. Schoch at The University of Texas is the only known process by which methane can be converted into acetylene economically.

Inasmuch as the future supply of motor fuels, especially in the face of declining petroleum resources, will apparently become an outstanding problem in the near future, attention should be directed to the possibilities of using natural gas to add substantially to our gasoline supplies. This matter has been concisely summed up by Frolich as follows:

The domestically available energy source most closely related to crude oil is natural gas. The production and consumption of natural gas by states, although by no means identical to the distribution shown for crude oil . . . follows much the same pattern in that transportation by pipe line makes for a marked flexibility in distribution. To most of us it does not mean much when we are told that the country's proved natural gas reserves amount to some 95 trillion cubic feet. A little figuring will show, however, that on a weight basis this is equal to about 75 per cent of the proved reserves of petroleum. At the present rate of consumption proved gas supply should last about thirty years, or twice as long as the oil supply. Methods are known for converting these natural gas hydrocarbons into liquid petroleum fractions. The heavier constituents can be processed by such direct methods as cracking or dehydrogenation, followed by polymerization and alkylation. Methane, however, which is the major constituent of natural gas, can best be converted into gasoline by the Fischer-Tropsch process. In that case methane must first be reacted with steam to give a mixture of carbon monoxide and hydrogen, which is then treated with a catalyst to produce liquid hydrocarbons. Technical information is available on this process, but as yet this country has no large-scale operating experience. The process has been used commercially in Germany for some time, and a small pilot-plant unit for carrying out the Fischer-Tropsch synthesis is now in operation by the Bureau of Mines. It would be unwise at this time to make any prediction in regard to the amount of gasoline that might be produced in this manner.

Owing to Texas' huge stake in the natural gas reserves of the nation, and even still more to the fact that methane is the major component of natural gas the following quotations from the paper by Egloff, which emphasizes still more the significance of the Fscher-Tropsch process, are appropriate.

One big field in the utilization of natural gas that merits discussion is the water gas reaction. In the U. S. we have an estimated 2,600 billion cu. ft. of natural gas produced yearly. Methane can be readily converted into hydrogen and carbon monoxide by high temperatures in the presence of steam. Hydrogen and carbon monoxide react together, forming both formaldehyde and methanol or wood alcohol.

In Germany, the Fischer-Tropsch process has been developed whereby the reaction is controlled so that hydrocarbons are the primary products, made up of methane, ethane, ethylene, propane, propylene, butane, butylenes, liquids including gasoline, gas oil, Diesel oil and even solids such as paraffin wax.

The reaction takes place in the presence of a catalyst which may be the oxides of nickel, chromium or cobalt, with temperatures of 400° F. and 200 lbs. pressure. . . .

The gasoline produced by this water gas reaction, starting from methane from natural gas, is poor in quality with about a 40 octane rating. It has to be cracked either thermally or catalytically into something more useful. The gasoline fraction boiling up to 300° F. contains between 40 and 50% olefins which may be combined one with the other to form lubricating oil.

This lubricating oil was produced by Ruhr-Chemie in 1938, and some of it was very high grade. The balance of the gasoline fraction, the paraffins, hexanes, heptanes, etc., are thermally cracked under controlled conditions so as to make more olefins, which in turn are polymerized into lubricating oil fractions. They have from time to time cracked paraffin wax. This reaction of making hydrocarbons from carbon monoxide and hydrogen produces a very high grade Diesel oil, with over 100 Diesel index blending with lower grade Diesel oils.

These are just a few of the important processes that are in operation or in the making in which hydrocarbons from natural gas can be used. However, progress is not made, as you all know, unless you put armies of men to studying and experimenting to convert this raw material into the higher uses to which we are entitled. Much work is going on but not enough. Two problems that we must solve in the greater utilization of natural gas are the commercial processing of methane and ethane. Methane is the most difficult of the hydrocarbons to convert into something else cheaply. You can do anything at a price. As a matter of fact, if you start with methane gas alone you can produce all the synthetic products that man has produced in organic chemistry, and there are over 300,000 different ones, that may be utilized as fuels, lubricating oils, fatty acids and many others too numerous to mention. The hydrocarbon is there waiting to be converted into the manifold products that man requires in a modern civilization.

In conclusion ,it hardly seems necessary to reëmphasize the tremendous stake Texas has in the natural gas resources of the United States or the immensity of the importance of natural gas to Texas—nor should it be necessary to stress the fact that in both these respects, the Texas situation will become progressively more significant in the next few years. The promise natural gas gives for substantially supplementing our future gasoline supplies alone would entitle Texas natural gas reserves to very careful consideration. The possibilities Texas has for the development of a vast synthetic organic chemicals industry based upon the State's wealth of hydrocarbons are almost breath-taking

It is as yet impossible to do more than suggest some of the mile-posts that appear as certain on the horizon of future chemical developments based upon hydrocarbons which are readily supplied from petroleum and natural gas. What is certain is that these developments loom large and that they will occupy a highly important position in the expanding economy that will come in the post-war period.

What is also certain is that modern chemical technology can utilize the hydrocarbons of natural gas in many of these developments just as well as, if not better than, those obtainable from petroleum. In all these things Texas has a vital interest. Should not Texas be truly concerned as to their best use?

ELMER H. JOHNSON.

Cotton in the Post-War Economy of Texas

Cotton production was the major activity in the development of Texas economy prior to 1914. Cotton gins were the essential enterprises around which other service trades and industries congregated to form many hundreds of towns in Texas to serve rapidly developing cotton communities. Cottonseed crushing became one of Texas' biggest manufacturing industries as early as 1889 and has continued to rank high in the expanding list of Texas industries. Cotton acreage continued to increase annually in Texas down to 1926–27, when it reached an all-time high of 17,700,000 acres; but even so, petroleum production and the industries associated with it had already wrested leadership from cotton as the leading builder in development of the State.

The place cotton occupies in the economy of Texas has been, and will continue to be, determined by powerful dynamic factors and forces, some operating within the State and others beyond its borders. Some of these have their foundation in the physical environment, many have resulted from technological developments, while others grew out of human characteristics and institutional forces. The purpose here is to interpret some of these forces as indicators of the place of cotton in the post-war economy of Texas.

Since 1928 cotton has lost tremendously in importance in the economy of Texas. The area harvested in cotton in Texas has declined from the high of 17,700,000 acres in 1926 down to only 7,888,000 in 1943. The farm cash income received from cotton and cottonseed in Texas declined from over $500,000,000 in 1927 to a low of less than $150,000,000 in 1939, and a rebound to a little over $300,000,000 in 1942 as a result of war prices. The Decennial Census of 1940 shows that there was a decline in employment in agriculture in Texas from 1930 to 1940 of 194,000 jobs. This loss of employment is associated directly with the decline in cotton production.

One of the most important problems confronting the people of Texas is to arrive at a clear understanding of the place this great industry can and should occupy in the State's post-war economy. Before this can be done, it is necessary to come to an understanding of the State's overall economy in the years ahead.

The economy of Texas is evolving from a predominantly raw-material-producing dependent economy to an independent, specialized, regional unit in our great national industrial economy. The increased diversification in agriculture, manufacturing, and service industries is making Texas relatively independent for most of the necessities of every day life, but it is still dependent on outside markets to purchase its surplus raw materials and on outside sources for many important articles, especially manufactured goods in the luxury class.

Texas' economy is now going through evolutionary changes due to the war and technological developments, which have suddenly thrust forward the industrial development of the State many years, provided a reasonable portion of the new war industries and developments become permanent.

It is assumed here that since most of these new industries are built on a sound resource base in line with logical development, they will be permanent and that their products of magnesium, steel, rubber and many chemicals will become the raw materials for a large development of consumption goods manufacturing, and service industries and trades. These developing industries and trades will continue to provide a widening base for continuing growth of Texas cities and industrial areas.

It is into this changing structure of Texas' economy that we must visualize the place of cotton during the years following the war. The natural environment in Texas, due to its location on the globe, the North American Continent, the Gulf of Mexico, and its physiographic features when taken in connection with the physical requirements of plants and animals becomes the dominant factor in determining what can be produced most advantageously on Texas farms and ranches. In its predominant features Texas has a slightly humid to subhumid climate subject to droughts. It has a relatively smooth topography adapted to machine production. Because of its natural environment, most of Texas was originally a grass country adapted especially to range livestock. Years of developmental experience have proved that next to grass, cotton is Texas' most reliable crop. It is a shrub-like plant capable of reviving and making a crop after a period of arrested growth due to drought.

In view of our changing economy and the dominant natural factors surrounding our agricultural production, how much cotton should Texas grow in the immediate post-war period? Space will permit only the briefest statements of facts which suggest an answer to this question.

Cotton is still the most reliable crop in Texas. Cotton fits well into the changing economy of the State, provided we take full advantage of the State's opportunities for mechanized production.

The development of a large urban population is calling for important expansions in the production of dairy products and finished meat animals. Both of these require large amounts of high protein-content feeds. Cotton has the facility of supplying large amounts of this feed as a by-product. In addition, it produces one of the finest vegetable oils of which there is a national deficit.

Feed rations recommended for dairy cows in this State require about 1,200 pounds of high protein-content feed per year, of which about 600 pounds should be cottonseed meal. Cottonseed hulls with a feed value of little more than grass hay furnishes an ideal roughage in which to feed the meal. This means that the seed from each bale and a half of cotton produced provides half the concentrates and a large per cent of the equivalent hay requirements for one dairy cow for a year. On this basis alone Texas needs to grow at least 2,000,000 bales of cotton to supply its present milk cow population. In addition to this, it needs to grow the requirements of 250,000 dairy heifers one and two years of age, amounts sufficient to winter our sheep, goats and range cattle, and an additional amount to maintain a livestock fattening program. All of these urgent demands will require the production of 3,500,000 or more bales of cotton annually in Texas.

The very serious unemployment and re-employment problems in the post-war period involving over 500,000 workers in Texas alone means that we must utilize every source of employment to the limit in this adjustment period. Cotton production and harvest is the biggest employer of labor in agriculture. According to the Texas Agricultural Experiment Station, cotton grown with two-row tractor equipment requires about twenty-five man hours per acre, whereas grain sorghums grown under the same condition require only ten hours, and small grains less than three. Moreover, an increase in cotton acreage means increased opportunities for employment in many more ways than just cotton production.

The world market will readily absorb all the cotton Texas can grow, at a reasonable price, provided equitable trade relations can be quickly established after the war.

The rising tide of synthetic fibers indicates that it will be highly important for Texas to use the few years of post-war adjustment to put its cotton production on the soundest possible basis. It can do this by permitting cotton production to gravitate to those areas and into those sized farm units where it can be produced most efficiently in relation to the whole economy, including livestock industries and the use of modern equipment in farm management practice.

A. B. Cox.

COTTON BALANCE SHEET FOR THE UNITED STATES AS OF NOVEMBER 1, 1943

(In Thousands of Running Bales Except as Noted)

Year	Carryover Aug. 1	Imports to Nov. 1	Gov. Est. as of Nov. 1	Total	Consumption Aug. 1 to Nov. 1	Exports Aug. 1 to Nov. 1	Total	Balance Nov. 1
1934–1935	7,746	30	9,634	17,410	1,237	1,322	2,559	14,851
1935–1936	7,138	22	11,141	18,301	1,412	1,440	2,852	15,449
1936–1937	5,397	32	12,400	17,829	1,856	1,613	3,469	14,360
1937–1938	4,498	22	18,243	22,763	1,729	1,626	3,355	19,408
1938–1939	11,533	40	12,137	23,710	1,637	1,054	2,691	21,019
1939–1940	13,033	37	11,845	24,915	1,941	1,744	3,685	21,230
1940–1941	10,596	30	12,847	23,473	2,064	350	2,414	21,059
1941–1942	12,376	109	11,020	23,505	2,703	439	3,142	20,363
1942–1943	10,590	†	13,329	23,919	2,864	†	2,864	21,055
1943–1944	10,687	†	11,442	22,129	1,718	†	2,561	20,411

The Cotton Year Begins August 1.
*Figures are in 500-pound bales.
†Not available.

EMPLOYMENT AND PAY ROLLS IN TEXAS

October, 1943

	Estimated Number of Workers Employed* Sept., 1943(1)	Oct., 1943(2)	Percentage Change from Sept., 1943	Percentage Change from Oct., 1942	Estimated Amount of Weekly Pay Roll Sept., 1943(1)	Oct., 1943(2)	Percentage Change from Sept., 1943	Percentage Change from Oct., 1942
MANUFACTURING								
All Manufacturing Industries	167,193	168,830	+ 1.0	+ 4.1	5,314,663	5,499,714	+ 3.5	+ 27.2
Food Products								
Baking	8,075	8,163	+ 1.1	+ 0.4	249,372	252,416	+ 1.2	+ 17.0
Carbonated Beverages	4,431	4,103	− 7.4	+ 37.1	121,212	112,617	− 7.1	+ 29.5
Confectionery	1,228	1,491	+ 21.4	+ 26.9	16,052	19,578	+ 22.0	+ 45.0
Flour Milling	2,213	2,309	+ 4.3	+ 19.2	65,471	67,385	+ 2.9	+ 57.0
Ice Cream	1,481	1,397	− 5.7	+ 4.9	37,613	35,964	− 4.4	+ 16.8
Meat Packing	6,381	6,897	+ 8.1	+ 0.9	209,525	232,329	+ 10.9	+ 11.8
Textiles								
Cotton Textile Mills	5,704	5,695	− 0.2	− 17.8	125,698	129,999	+ 3.4	− 7.3
Men's Work Clothing	4,149	4,190	+ 1.0	− 19.7	69,200	74,528	+ 7.7	− 3.2
Forest Products								
Furniture	1,650	1,795	+ 8.8	− 2.8	39,558	43,640	+ 10.3	+ 21.5
Planing Mills	2,097	2,028	− 3.3	− 12.3	53,912	54,920	+ 1.9	− 9.9
Saw Mills	15,518	15,781	+ 1.7	− 4.5	292,218	304,260	+ 4.1	+ 16.9
Paper Boxes	948	985	+ 3.9	+ 45.4	20,424	23,343	+ 14.3	+ 49.0
Printing and Publishing								
Commercial Printing	2,361	2,316	− 1.9	+ 0.7	76,386	75,919	− 0.6	+ 18.0
Newspaper Publishing	4,164	4,223	+ 1.4	− 8.9	120,971	125,643	+ 3.9	+ 5.7
Chemical Products								
Cotton Oil Mills	3,553	3,705	+ 4.3	− 9.0	57,336	64,085	+ 11.8	+ 13.5
Petroleum Refining	22,932	22,952	+ 0.1	+ 1.7	1,296,108	1,284,564	− 0.9	+ 29.0
Stone and Clay Products								
Brick and Tile	1,492	1,486	− 0.5	− 8.1	23,495	25,409	+ 8.1	− 0.1
Cement	1,095	1,080	− 1.3	− 15.9	41,628	39,548	− 5.0	− 13.9
Iron and Steel Products								
Structural and Ornamental Iron	2,869	2,777	− 3.2	− 3.3	81,677	82,245	+ 0.7	+ 16.9
NONMANUFACTURING								
Crude Petroleum Production	25,732	25,588	− 0.6	− 1.4	1,342,982	1,352,627	+ 0.7	+ 27.6
Quarrying	(3)	(3)	− 1.2	− 14.8	(3)	(3)	+ 0.3	+ 2.1
Public Utilities	(3)	(3)	+ 0.1	+ 7.3	(3)	(3)	− 3.0	+ 15.7
Retail Trade	226,305	234,433	+ 3.6	+ 12.7	4,864,808	5,128,166	+ 5.4	+ 21.6
Wholesale Trade	60,393	60,613	+ 0.4	− 7.7	2,207,197	2,303,896	+ 4.4	+ 7.1
Dyeing and Cleaning	2,916	2,808	− 3.7	− 3.8	60,987	60,256	− 1.2	+ 14.2
Hotels	19,533	19,314	− 1.1	+ 16.8	321,405	315,327	− 1.9	+ 47.0
Power Laundries	13,968	14,192	+ 1.6	− 5.1	235,046	238,343	+ 1.4	+ 12.8

CHANGES IN EMPLOYMENT AND PAY ROLLS IN SELECTED CITIES(4)

	Employment Percentage Change Sept., 1943 to Oct., 1943	Employment Percentage Change Oct., 1942 to Oct., 1943	Pay Rolls Percentage Change Sept., 1943 to Oct., 1943	Pay Rolls Percentage Change Oct., 1942 to Oct., 1943
Abilene	+ 2.6	+ 34.0	+ 1.7	+ 29.5
Amarillo	− 3.2	− 11.0	− 1.4	− 6.7
Austin	− 0.6	− 7.2	− 1.8	+ 7.3
Beaumont	+ 3.2	+ 4.3	+ 2.9	+ 22.2
Dallas	+ 7.9	+ 38.7	+ 8.5	+ 68.5
El Paso	+ 0.3	− 6.7	+ 0.5	+ 12.8
Fort Worth	+ 3.6	+ 97.5	− 2.1	+ 111.4
Galveston	+ 4.3	− 9.9	+ 21.1	+ 37.3
Houston	+ 0.1	+ 11.8	− 5.2	+ 19.2
Port Arthur	− 0.7	+ 0.1	+ 1.7	+ 25.6
San Antonio	+ 0.5	− 1.0	+ 1.3	+ 7.7
Sherman	− 1.3	+ 3.1	+ 1.5	+ 19.5
Waco	− 2.0	− 0.5	− 0.4	+ 5.5
Wichita Falls	+ 2.3	− 11.8	+ 5.2	+ 18.4
STATE	+ 2.9	+ 21.4	+ 2.5	+ 35.7

ESTIMATED NUMBER OF EMPLOYEES IN NONAGRICULTURAL BUSINESS AND GOVERNMENT ESTABLISHMENTS(5)

	1941(1)	1942(1)	1943
January	1,094,000	1,170,000	1,360,000(1)
February	1,120,000	1,199,000	1,367,000(1)
March	1,120,000	1,226,000	1,384,000(1)
April	1,114,000	1,222,000	1,402,000(6)
May	1,120,000	1,251,000	1,427,000(6)
June	1,134,000	1,291,000	1,448,000(6)
July	1,156,000	1,317,000	1,450,000(1)
August	1,176,000	1,352,000	1,441,000(2)
September	1,203,000	1,373,000	
October	1,219,000	1,384,000	
November	1,219,000	1,389,000	
December	1,222,000	1,413,700	

*Does not include proprietors, firm members, officers of corporations, or other principal executives. Factory employment excludes also office, sales, technical and professional personnel.

(1)Revised.

(2)Subject to revision.

(3)Not available.

(4)Based on unweighted figures.

(5)Not including self-employed persons, casual workers, or domestic servants, and exclusive of military and maritime personnel. These figures are furnished by the Bureau of Labor Statistics; U.S. Department of Labor.

(6)No change.

Prepared from reports from representative Texas establishments to the Bureau of Business Research coöperating with the Bureau of Labor Statistics.

Due to the national emergency, publications of data for certain industries is being withheld until further notice.

OCTOBER RETAIL SALES OF INDEPENDENT STORES IN TEXAS

	Number of Establishments Reporting	Percentage Changes in Dollar Sales: Oct., 1943 from Oct., 1942	Oct., 1943 from Sept., 1943	Year 1943 from Year 1942
TOTAL TEXAS	971	+22.7	+ 6.3	+29.2
STORES GROUPED BY LINE OF GOODS CARRIED:				
APPAREL				
Family Clothing Stores	24	+33.4	+17.8	+50.1
Men's and Boys' Clothing Stores	32	+35.8	+11.9	+49.4
Shoe Stores	13	+ 2.7	− 1.9	+36.9
Women's Specialty Shops	34	+21.5	− 0.1	+53.2
AUTOMOTIVE*				
Motor Vehicle Dealers	66	+22.8	− 5.5	+19.5
COUNTRY GENERAL	98	+16.5	+ 5.0	+21.1
DEPARTMENT STORES	59	+31.6	+ 8.3	+40.7
DRUG STORES	111	+18.5	+ 1.7	+26.2
DRY GOODS AND GENERAL MERCHANDISE	3	+ 8.5	+ 8.3	+ 8.6
FILLING STATIONS	32	+15.6	+12.7	+21.7
FLORISTS	19	+38.4	+15.5	+45.0
FOOD*				
Grocery Stores	33	+19.0	+ 8.5	+17.5
Grocery and Meat Stores	100	+13.7	+ 0.8	+21.0
FURNITURE AND HOUSEHOLD*				
Furniture Stores	66	+ 5.0	+14.8	+22.9
JEWELRY	24	+36.0	+16.8	+36.1
LUMBER, BUILDING, AND HARDWARE*				
Farm Implement Dealers	12	−15.7	+ 0.3	−11.1
Hardware Stores	53	+ 5.2	+14.8	− 3.1
Lumber and Building Material Dealers	105	− 3.7	+ 8.3	−17.9
RESTAURANTS	27	+11.7	− 0.1	+28.2
ALL OTHER STORES	7	+27.9	+25.8	+16.4
TEXAS STORES GROUPED ACCORDING TO POPULATION OF CITY:				
All Stores in Cities of—				
Over 100,000 Population	151	+30.0	+ 6.7	+34.5
50,000–100,000 Population	113	+12.2	+ 4.7	+22.7
2,500–50,000 Population	476	+19.1	+ 6.8	+28.4
Less than 2,500 Population	231	+15.9	+ 5.8	+13.9

*Group total includes kinds of business other than the classification listed.
Prepared from reports of independent retail stores to the Bureau of Business Research, coöperating with the U.S. Bureau of the Census.

OCTOBER CREDIT RATIOS IN TEXAS DEPARTMENT AND APPAREL STORES

(Expressed in Per Cent)

	Number of Stores Reporting	Ratio of Credit Sales to Net Sales		Ratio of Collections to Outstandings		Ratio of Credit Salaries to Credit Sales	
		1943	1942	1943	1942	1943	1942
All Stores	56	45.7	54.5	74.5	60.5	0.9	1.0
Stores Grouped by Cities:							
Austin	6	40.9	45.2	75.2	69.7	1.0	1.2
Dallas	8	53.5	59.1	93.3	58.2	0.7	0.7
El Paso	3	41.6	44.6	66.5	59.9	1.0	1.3
Fort Worth	5	42.0	51.2	71.3	62.1	1.0	1.1
Houston	5	44.9	55.3	57.5	57.6	1.4	1.3
San Antonio	4	39.4	40.0	65.3	63.5	1.4	1.8
Waco	5	46.1	52.7	60.0	56.9	1.0	0.9
All Others	20	41.8	76.2	72.4	66.6	0.8	0.6
Stores Grouped According to Type of Store:							
Department Stores (Annual Volume Over $500,000)	18	44.7	56.0	66.1	67.8	1.0	1.0
Department Stores (Annual Volume under $500,000)	10	38.8	38.8	66.5	64.3	1.0	1.3
Dry-Goods-Apparel Stores	3	39.6	44.5	70.7	63.7	1.5	1.6
Women's Specialty Shops	14	51.3	54.7	61.1	55.5	0.6	0.5
Men's Clothing Stores	11	44.2	52.0	69.4	59.7	1.0	1.2
Stores Grouped According to Volume of Net Sales During 1943:							
Over $2,500,000	12	42.6	52.1	64.8	60.9	1.0	1.0
$2,500,000 down to $1,000,000	12	46.9	49.5	65.0	60.5	0.9	0.8
$1,000,000 down to $500,000	8	32.0	40.5	65.0	64.1	0.9	1.2
Less than $500,000	24	36.2	35.9	68.6	65.5	1.0	1.5

NOTE: The ratios shown for each year, in the order in which they appear from left to right are obtained by the following computations: (1) Credit Sales divided by Net Sales. (2) Collections during the month divided by the total accounts unpaid on the first of the month. (3) Salaries of the credit department divided by credit sales. The data are reported to the Bureau of Business Research by Texas retail stores.

OCTOBER RETAIL SALES OF INDEPENDENT STORES IN TEXAS

(By Districts)

	No. of Establishments Reporting	Percentage Changes Oct., 1943 from Oct., 1942	Oct., 1943 from Sept., 1943	Year, 1943 from Year, 1942
TOTAL TEXAS	971	+ 23	+ 5	+ 29
TEXAS STORES GROUPED BY PRODUCING AREAS:				
District 1-N	66	+ 9	+ 2	+ 26
Amarillo	21	+ 1	+ 6	+ 29
Pampa	12	+ 10	+ 2	+ 13
Plainview	14	+ 26	− (1)	+ 27
All Others	19	+ 12	− 6	+ 23
District 1-S	28	+ 37	+ 18	+ 44
Lubbock	13	+ 41	+ 14	+ 43
All Others	15	+ 30	+ 26	+ 46
District 2	73	+ 3	+ 2	+ 23
Abilene	11	+ 2	− 8	+ 35
All Others	62	+ 3	+ 7	+ 20
District 3	36	+ 19	− 2	+ 18
District 4	233	+ 30	+ 9	+ 37
Corsicana	11	+ 16	+ 15	+ 16
Dallas	39	+ 38	+ 11	+ 46
Ft. Worth	26	+ 32	+ 8	+ 31
Sherman	11	+ 1	+ 4	+ 13
Temple	18	− 4	+ 5	+ 16
Waco	21	+ 14	+ 4	+ 42
All Others	107	+ 17	+ 2	+ 29
District 5	97	+ 15	+ 5	+ 22
District 6	45	+ 21	+ 4	+ 25
El Paso	25	+ 22	+ 3	+ 25
All Others	20	+ 5	+ 11	+ 26
District 7	49	+ 14	+ 3	+ 20
San Angelo	10	+ 16	+ 2	+ 24
All Others	39	+ 11	+ 5	+ 19
District 8	162	+ 12	+ 4	+ 23
Austin	15	− 8	+ 4	+ 14
San Antonio	45	+ 16	+ 4	+ 28
All Others	102	+ 20	+ 4	+ 19
District 9	113	+ 25	+ 5	+ 27
Beaumont	11	+ 15	+ 6	+ 28
Galveston	10	+ 13	+ 14	+ 13
Houston	40	+ 32	+ 3	+ 28
Quanah	10	+ 32	+ 17	+ 32
All Others	42	+ 15	+ 5	+ 25
District 10	27	+ 26	+ 6	+ 33
District 10-A	42	+ 58	+ 25	+ 30
Brownsville	11	+101	+ 22	+ 70
All Others	31	+ 36	+ 27	+ 25

(1) Change of less than .5%.
NOTE: Prepared from reports of independent retail stores to the Bureau of Business Research, coöperating with the U.S. Bureau of the Census.

COMMODITY PRICES

	Oct., 1943	Oct., 1942	Sept., 1943
Wholesale Prices:			
U.S. Bureau of Labor Statistics (1926=100%)	103.0	100.0†	103.1†
Farm Prices:			
U.S. Department of Agriculture (1910-1914=100%)	*	*	193.0†
U.S. Bureau of Labor Statistics (1926=100%)	122.2†	109.0	123.5†
Retail Prices:			
Food (U.S. Bureau of Labor Statistics (1935-1939=100%)	138.2	129.6	137.4
Dept. Stores (Fairchild's Publications, January, 1931=100%)	113.1	113.1	131.1

*Not available.
†Preliminary.
‡Revised.

POSTAL RECEIPTS

	October, 1943	October, 1942	September, 1943
Abilene	$ 44,820	$ 37,131	$ 39,372
Amarillo	54,357	31,481	51,041
Austin	84,627	87,830	86,108
Beaumont	42,921	39,025	41,503
Big Spring	11,540	9,578	8,765
Brownsville	13,294	8,360	10,036
Brownwood	20,610	15,466	24,615
Childress	5,579	4,427	6,243
Cleburne	4,853	4,312	4,632
Coleman	4,218	3,725	3,450
Corpus Christi	60,845	48,020	56,073
Corsicana	10,643	8,263	8,186
Dallas	512,785	477,673	502,831
Del Rio	6,373	4,546	5,271
Denison	10,013	8,488	8,308
Denton	12,694	12,092	9,707
Edinburg	4,220	3,554	4,220
El Paso	90,301	76,325	83,060
Fort Worth	221,999	214,430	215,465
Galveston	48,000	44,445	43,754
Gladewater	4,419	3,797	3,404
Graham	3,544	2,938	2,783
Harlingen	11,848	10,178	10,749
Houston	355,361	310,375	315,296
Jacksonville	5,426	4,153	6,623
Kenedy	2,656	2,035	2,385
Kerrville	4,338	3,262	3,581
Lubbock	37,573	27,379	29,134
Lufkin	6,918	6,686	6,247
McAllen	7,192	6,257	5,392
Marshall	10,770	10,466	9,192
Palestine	8,034	6,595	6,768
Pampa	10,249	8,880	8,827
Paris	18,708	10,751	19,868
Plainview	5,813	5,493	4,850
Port Arthur	26,326	22,660	22,981
San Angelo	19,937	17,034	18,290
San Antonio	258,553	209,459	225,856
Sherman	11,669	10,625	11,255
Snyder	2,662	2,171	2,224
Sweetwater	7,647	5,131	6,463
Temple	15,579	11,445	14,828
Texarkana	24,531	20,860	22,951
Tyler	30,830	20,854	29,089
Waco	51,389	45,272	46,534
Wichita Falls	42,137	37,345	39,810
TOTAL	$2,248,801	$1,961,272	$2,088,015

NOTE: Compiled from reports from Texas chambers of commerce to the Bureau of Business Research.

TEXAS CHARTERS

	October 1943	October 1942	September 1943
Domestic Corporations:			
Capitalization*	$ 264	$ 325	$ 805
Number	21	39	37
Classification of new corporations:			
Banking-Finance	2	0	2
Manufacturing	4	5	3
Merchandising	5	8	3
Oil	1	2	1
Public Service	0	1	0
Real Estate Building	7	11	15
Transportation	1	5	1
All Others	1	7	12
Number capitalized at less than $5,000	7	17	12
Number capitalized at $100,000 or more	0	0	2
Foreign Corporations (Number)	4	20	14

*In thousands.
NOTE: Compiled from records of the Secretary of State.

PETROLEUM

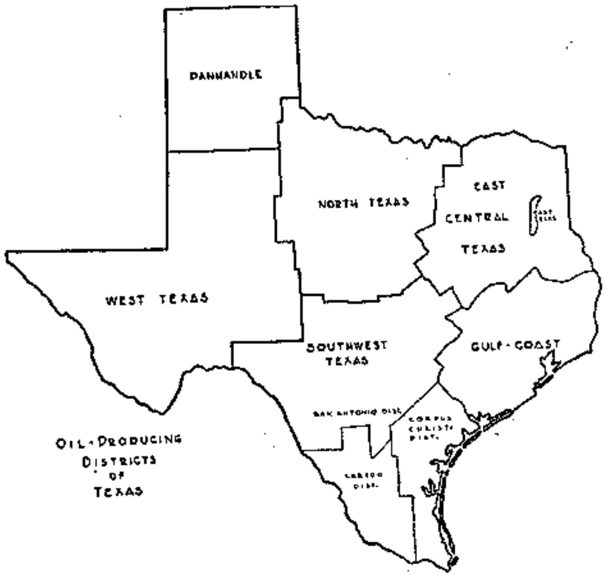
Daily Average Production (In Barrels)

	October 1943	October 1942	September 1943
Coastal Texas*	519,350	313,750	483,200
East Central Texas	135,250	92,150	130,550
East Texas	368,700	362,000	379,050
North Texas	138,300	140,000	140,550
Panhandle	88,100	88,600	103,350
Southwest Texas	288,150	165,300	260,400
West Texas	354,050	209,750	325,050
State	1,891,900	1,371,550	1,882,150
United States	4,398,750	3,894,400	4,327,400

Gasolnie sales as indicated by taxes collected by the State Comptroller were: September, 1943, 101,616,354 gallons; September, 1942, 117,225,000 gallons; August, 1943, 118,582,993 gallons.

*Includes Conroe.

Note: From American Petroleum Institute. See accompanying map showing the oil-producing districts of Texas.



LUMBER

(In Board Feet)

	October 1943	October 1942	September 1943
Southern Pine Mills:			
Average Weekly Production per unit	238,575	279,210	222,702
Average Weekly Shipments per unit	222,181	305,485	244,757
Average Unfilled Orders per unit, end of month	1,553,258	1,665,904	1,482,516

Note: From Southern Pine Association.

TEXAS COMMERCIAL FAILURES

	October 1943	October 1942	September 1943
Number	0	8	0
Liabilities*	0	39	0
Assets*	0	25	0
Average Liabilities per failure*	0	5	0

*In thousands.

Note: From Dun and Bradstreet, Inc.

BUILDING PERMITS

	October, 1943	October, 1942	September, 1943
Abilene	$ 32,088	$ 6,195	$ 3,588
Amarillo	41,869	77,588	25,018
Austin	35,179	26,383	64,653
Beaumont	27,157	77,588	25,018
Brownsville	4,469	6,076	12,281
Coleman	3,500	0	150
Corpus Christi	93,153	127,913	147,265
Corsicana	3,700	455	1,080
Dallas	1,161,384	238,984	359,791
Del Rio	4,722	2,105	6,880
Edinburg	635	60	10,255
Denton	6,675	6,750	6,300
El Paso	20,319	470,300	27,807
Fort Worth	373,650	341,012	750,935
Galveston	102,029	19,351	70,667
Gladewater	650	1,400	2,540
Graham	500	0	1,580
Harlingen	475	400	0
Houston	330,245	168,036	673,520
Jacksonville	0	350	1,025
Kenedy	0	0	1,500
Kerrville	777	260	365
Lubbock	22,722	19,430	27,283
McAllen	5,000	2,120	24,125
Marshall	7,110	9,986	5,760
Midland	3,400	2,251	1,600
New Braunfels	1,525	240	4,088
Palestine	2,100	1,920	330
Pampa	18,260	2,000	2,450
Paris	8,970	65,482	17,500
Plainview	4,650	0	7,000
Port Arthur	44,908	7,796	19,348
San Antonio	260,701	277,651	291,672
Sherman	10,155	11,541	11,370
Snyder	1,800	3,170	0
Sweetwater	15,305	4,155	1,520
Tyler	18,132	7,575	14,424
Waco	32,777	124,871	37,397
Wichita Falls	23,699	64,903	16,817
TOTAL	$2,724,380	$2,115,934	$2,688,927

Note: Compiled from reports from Texas chambers of commerce to the Bureau of Business Research.

CEMENT

(In Thousands of Barrels)

	October 1943	October 1942	September 1943
Texas Plants			
Production	788	1,076	730
Shipments	723	1,007	683
Stocks	883	442	818
United States			
Production	11,189	18,263	11,380
Shipments	11,288	20,344	12,296
Stocks	19,604	10,627	19,704
Capacity Operated	53.0%	87.0%	56.0%

Note: From U.S. Department of Interior, Bureau of Mines.

PERCENTAGE CHANGES IN CONSUMPTION OF ELECTRIC POWER

	October, 1943 from October, 1942	October, 1943 from September, 1943
Commercial	+ 20.0	− 12.8
Industrial	+ 44.9	− 2.9
Residential	+ 18.1	− 10.7
All Others	+146.8	− 17.0
TOTAL	+ 48.3	− 8.9

Prepared from reports of 7 electric power companies to the Bureau of Business Research.

DAIRY PRODUCTS MANUFACTURED IN PLANTS IN TEXAS

Products and Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
CREAMERY BUTTER (1000 lb.)													
1943*	3,012	3,001	2,724	3,446	4,740	4,275	4,051	3,452	2,629	2,581			
1942*	2,341	2,076	2,131	3,311	4,396	4,358	3,937	3,684	3,602	3,243	2,659	2,341	38,066
1930–39 average	2,074	2,109	2,392	3,138	3,556	3,166	4,113	2,867	2,513	2,608	2,301	2,211	32,048
ICE CREAM (1000 gal.)													
1943*	1,554	1,218	1,408	1,823‡	2,327‡	2,391‡	2,758‡	2,763‡	1,999‡	1,622			
1942*	745	700	1,014	1,312	1,812	2,305	2,476	2,324	1,911	1,698	1,323	1,046	16,089
1930–39 average	1,215	1,262	434	570	752	893	904	846	686	460	259	205	6,486
AMERICAN CHEESE (1000 lb.)													
1943*	874	1,025	1,108	1,633	2,120	1,943	1,896	1,405	1,019	819			
1942*	1,308	1,302	1,644	2,204	2,756	2,674	2,580	2,048	1,604	1,221	713	735	20,717
1930–39 average	554	590	737	1,050	1,215	1,129	1,119	1,025	866	852	718	641	10,496
MILK EQUIVALENT OF DAIRY PRODUCTS† (1000 lb.)													
1943*	98,377	90,422	88,540	115,788	154,491	142,700	143,120	124,558	93,186	85,084			
1942*	75,435	77,913	83,621	105,047	148,707	145,064	145,868	131,841	119,279	104,273	83,502	72,806	1,237,136
1930–39 average	54,675	57,139	67,456	89,641	104,323	97,562	97,075	89,185	76,165	73,444	60,119	55,872	922,656

*Estimates of production made by the Bureau of Business Research.

†Milk equivalent of dairy products was calculated from production data by the Bureau of Business Research.

‡Includes ice cream, sherberts, ices, etc.

NOTE: 10-Year Average production of creamery butter, ice cream and American Cheese based on data from the Division of Agricultural Statistics, B.A.E.

OCTOBER, 1943, CARLOAD MOVEMENTS OF POULTRY AND EGGS

Shipments from Texas Stations

*Destination	Cars of Poultry, October: Chickens 1943	Chickens 1942	Turkeys 1943	Turkeys 1942	Cars of Eggs, October: Shell 1943	Shell 1942	Frozen 1943	Frozen 1942	Dried 1943	Dried 1942	Shell Equivalent† 1943	Shell Equivalent† 1942
TOTAL	8	13	3	8	28	33	67	71	85	119	842	1,127
Intrastate	0	4	2	2	13	28	36	45	2	8	101	182
Interstate	8	9	1	6	15	5	31	26	83	111	741	945
Receipts at Texas Stations												
TOTAL	6	16	2	1	69	77	16	45	9	18	173	311
Intrastate	1	6	1	1	34	23	9	35	7	16	108	221
Interstate	5	10	1	0	35	54	7	10	2	2	65	90

*The destination above is the first destination as shown by the original waybill. Changes in destination brought about by diversion factors are not shown.

†Dried eggs and frozen eggs are converted to a shell-egg equivalent on the following basis: 1 rail carload of dried eggs = 8 carloads of shell eggs, and 1 carload of frozen eggs = 2 carloads of shell eggs.

NOTE: These data furnished to the Division of Agricultural Statistics, B.A.E., by railroad officials through agents at all stations which originate and receive carload shipments of poultry and eggs. The data are compiled by the Bureau of Business Research.

SEPTEMBER SHIPMENTS OF LIVE STOCK CONVERTED TO A RAIL-CAR BASIS*

	Cattle 1943	Cattle 1942	Calves 1943	Calves 1942	Hogs 1943	Hogs 1942	Sheep 1943	Sheep 1942	Total 1943	Total 1942
Total Interstate Plus Fort Worth	6,978	7,678	2,104	2,084	1,234	925	1,235	1,487	11,560	12,174
Total Intrastate Omitting Fort Worth	791	1,916	221	392	88	49	301	520	1,401	2,877
TOTAL SHIPMENTS	7,769	9,594	2,325	2,476	1,331	974	1,536	2,007	12,961	15,051

TEXAS CAR-LOT* SHIPMENTS OF LIVE STOCK FOR YEAR 1943

	Cattle 1943	Cattle 1942	Calves 1943	Calves 1942	Hogs 1943	Hogs 1942	Sheep 1943	Sheep 1942	Total 1943	Total 1942
Total Interstate Plus Fort Worth	52,852	50,638	8,983	10,865	14,025	10,102	11,844	11,324	87,704	82,929
Total Intrastate Omitting Fort Worth	6,917	6,738	1,780	1,377	666	279	1,120	1,495	10,483	9,889
TOTAL SHIPMENTS	59,769	57,376	10,763	12,242	14,691	10,381	12,964	12,819	98,187	92,818

*Rail-car Basis: Cattle, 30 head per car; calves, 60; hogs, 80; and sheep, 250.

Fort Worth shipments are combined with interstate forwardings in order that the bulk of market disappearance for the month may be shown.

NOTE: These data are furnished the United States Bureau of Agricultural Economics by railway officials through more than 1,500 station agents, representing every live stock shipping point in the State. The data are compiled by the Bureau of Business Research.

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