1949

The Social Organization of the Petroleum Industry.

Thomas Stanton Dietrich

Louisiana State University and Agricultural & Mechanical College

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Plate I

Swamp Cypress and Oil Wells
Choctaw Oil Fields, Louisiana

Photo by Rosskam
THE SOCIAL ORGANIZATION OF THE PETROLEUM INDUSTRY

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Sociology

by

T. Stanton Dietrich
B. A., Wesleyan University, 1935
M. A., Louisiana State University, 1941
June 1948
their patience, love, and encouragement
in deepest appreciation

SIR, ELearning and FRIEND

To
ACKNOWLEDGMENTS

My indebtedness to Dr. Rudolf Heberle, Professor of Sociology, is quite beyond my capacity adequately to acknowledge. I am very grateful for his scholarly advice throughout this study, for his genial counsel and for his personal interest during the eight years of our association at Louisiana State University.

To my colleague, Mrs. Betsey Castleberry, I wish to express my appreciation for her assistance in the form of many helpful suggestions and for assuming unsolicited the thankless task of proof-reading all of the manuscript. My thanks are also extended to Mrs. Marguerite Hanchey and her assistants in the Geology Library for their generous aid and cooperation.

To my wife, I can merely say there is no greater love than for a wife to live with her fretful spouse while he is writing a dissertation, and to keep from underfoot two curious children; to proof-read and to correct the entire manuscript; and still, throughout the long ordeal, to remain very placid and cheerful.
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ABSTRACT

One of the most characteristic features of modern society has been the development of the large-scale industrial enterprise. Until very recently, the importance of the industrial enterprise to society has received only casual or cursory attention in sociological textbooks under "Economic Institutions"; however, an increasing and widespread interest in the field of "industrial sociology" has been evidenced by the number of studies of "human relations" in industry. Although a few sociologists have analysed in general the structure and functioning of a modern industrial enterprise as a social organization, there is still a great need for monographic studies of the social organization of particular industries.

While the petroleum industry, for example, has been the object of a number of critical studies, mostly from an economic or political point of view, there is still no impartial, comprehensive and up-to-date study of this basic and typically American industry in which it is viewed as a system of social interaction. The study presented here attempts to fill the gap.

The study attempts to present a systematic, comprehensive and up-to-date analysis of the petroleum industry as a social organization, including all phases of industry
activity from crude oil production to the marketing of finished petroleum products, but with special emphasis on the petroleum production and refining branches. In order to carry out such a program, relevant material of sociological significance has been gathered from numerous and heterogenous sources of literature on the petroleum industry, and from personal observations and interviews in the field.

Sociologically, the petroleum industry represents a vast, complex and dynamic social organization embracing a variety of social groups closely interrelated and coordinated for economic activity. The origin and development of the industry coincides with the beginning of the rapid expansion of industrial technology in the United States, and its dynamic characteristics are derived from past and present adjustments of the aggregate of its social groups to the continually changing social and cultural situations in American society.

Because the sociologist is chiefly interested in understanding and interpreting industrial society as a dynamic system of human relationships, he must first study scientifically the causality of its socio-historical development. This may be observed through changes in the culture complex of a society, through changes in the structure and organization of economic institutions, through the effect
such changes may have upon the occupations of the people engaged in the economic pursuit of earning a living, and upon the system of human relationships established between management and labor. The aim of this study is to carry out such a program for the petroleum industry.

Inasmuch as the social and cultural background of the petroleum industry has had an important bearing on its rapid development in America, a brief socio-historical perspective of the industry is presented in the first section of the main study, Part II. In this section there is a description of the culture transition in American society from vegetable and animal oil to "rock" oil, from sperm oil to high octane gasoline. This is followed by a discussion of the influence of technology upon the activities of the petroleum production, transportation, refining and marketing branches of the industry.

Changes in the economic structure of the petroleum industry since 1859, particularly the rise and fall of the Standard Oil Trust, are then described and analysed in Part III. One chapter of this section relates the importance of industry location to the vertical integrated structure of the industry, and another chapter is devoted to an analysis of the concentration of control exercised by the large, so-called "major", oil corporations, and the resultant effect of this concentration upon the smaller, "independent"
concerns. The economic development of the industry is traced from its early stages of disorganization and the era of individually owned and operated companies, to the highly efficient industry of today with its huge vertically-integrated and financially-controlled petroleum corporations.

Since the organization of human relations within the petroleum industry is of particular sociological importance, two sections of the study are concentrated upon an analysis of the human factor. In Part IV, the size, composition and socio-economic distribution of the labor force are analysed, after which there is a brief description of some of the principal occupations in the industry, with emphasis upon those found in the petroleum production and refining branches.

The concluding section of the main study, Part V, discusses the organization of industrial relations. Here considerable attention is paid to the policies and practices of the largest and most influential corporation in the petroleum industry, the Standard Oil Company (New Jersey). This corporation provides the major portion of the illustrative material utilized in the discussion of the bureaucratic features of management, and the structure and function of the two principal types of labor organization in the petroleum industry: the industrial union and the independent association.

In its comprehensive analysis of some of the more
important social aspects of the petroleum industry, the study thus provides the basis for subsequent social inquiry that may wish to treat more in detail some of the aspects which could only be but briefly touched upon within the scope of this thesis. The study also suggests a conceptual scheme of social organization that might provide a more uniform approach to similar monographic industrial studies in order that valid and sociological comparisons may be made between various industries. The organization of this study is an attempt to take an initial step in this direction.
PART I

INTRODUCTION
"Business is not merely nor even in the first instance a struggle of individuals for wealth. It is a way of life, a system of providing goods and services. It is not a segment of the community, co-operating or warring with other segments such as labor, consumers, or farmers. It is the community engaged in getting its daily bread. Its goal, its ethics, its welfare are inseparable from the goals and aspirations of the community."¹

In view of the interrelatedness of the economic and social systems of present day society, the thesis of this study is that modern technology has stimulated many important societal changes, that these changes have created problems of far-reaching consequence to the economic life in American culture, and that these problems basically are social problems associated with the system of human relationships in industrial organization which cannot be treated as entities separate and apart from the larger society.

Basic to the social and cultural changes in the modern industrialized society has been the effect of technology upon economic institutions. Modern technology has

increased the dependence of the industrial enterpriser upon financial and investment corporations, as a consequence of which there has been a vast change in the economic and social organization within modern industry. Characteristic of this change has been the growth of giant corporations through mergers and the development of huge holding companies, and the trend toward monopolistic practices that have resulted because of the degree to which control of industry has passed from the capitalistic entrepreneur and has become concentrated within large financial organizations.

Technology likewise has affected the system of industrial relations by widening the gap between the worker and his employer through the establishment of a bureaucratic system of indirect communication, a result of which has been that social interaction within modern industry has become highly impersonal. Not only has the social distance between employee and employer, between labor and management become greater, but occupational standardization and specialization also have contributed to lowering the status of labor. Opportunities for creative work are reduced to a minimum in the mass production process in which the work unit is divided into smaller and smaller units in order to increase the speed, efficiency and economy of output. The worker becomes little more than a human machine, and the efforts of any one individual become less important.
Throughout the economic history of the United States there has been an evident lag in the ability or the willingness of the business enterpriser and notably among management in the case of absentee or diffused ownership to make adjustments to the dynamic changes in human relations and social structures within industry that have been created by technological innovations. In part, the cultural lag in the area of industrial social relationships results because too often in the past the human factor has been considered merely as an impersonal factor of production. The history of industrial relations, unfortunately, is replete with tragic incidents of violence and bloodshed. Bitterness and distrust have become accepted as inherent to labor-management relations and have made it extremely difficult to bridge the widening gulf between employer and employee, despite the substitution of the bargaining table for "strong-arm" methods.

In explaining problems of labor, or industrial relations, as dislocations and maladjustments arising because of changes within the economic system, the economist primarily must rely upon economic principles and laws. However, it is becoming increasingly difficult, and it is not always an adequate explanation, to account for the problems of an industrial society merely by the application of such economic principles as the law of supply and demand, or the cyclical fluctuations of business activities. Any understanding of society and its social problems will be
meaningful only if the vast and complicated industrial structure of the economic system is also viewed and studied as a complex social organization.²

The sociologist views all economic activity as a dynamic system of social relationships and the economic institutions in society as functional organizations in which there is a considerable degree of social interaction among individual members. Therefore, the first approach of the sociologist to the study of industrial relations -- the system of human relations within industry -- which is a corollary to this study, is to consider modern industry as a dynamic and complex social organization whose origin has been dependent upon, and its growth influenced by, the stages of cultural development in the social order of which it is a part.

Purpose and Significance

It is the purpose of this study to present a sociological analysis of the petroleum industry in the United States. The study is not intended to be original in the sense of presenting new technological and economic knowledge

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about the petroleum industry. Its contribution to the general field of sociology, and to the more specific area of industrial society is that for the first time the vast amount of information and data available from a number of sources have been brought together systematically for sociological analysis and presentation.

The petroleum industry is viewed here as a dynamic and complex social organization that embraces a variety of social groups closely interrelated and coordinated for economic activity. From this point of view, it is "both a product of cultural integration and a very important part of the total culture" of modern society. It is the product and the producer of cultural change.

If the sociologist is primarily interested in understanding and interpreting industrial society as a dynamic system of human relationships, as this study maintains, then, logically, he must scientifically study the causality of its socio-historical development. Unless this is accomplished, then the trial and error efforts to understand and to solve the problems of industrial relations will be more in the nature of ameliorative or palliative measures, rather than preventive and curative. No satisfactory understanding or solution can obtain without the cognizance of the

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role cultural factors have played in establishing and influencing industrial relations. This may be observed through the changes in the culture complex of a society, through changes in the structure and organization of economic institutions, and through the effect such changes have upon the occupations and traditions, beliefs and modes of thinking of the people engaged in the economic pursuit of earning a living in the industrial social organization.

Scope

In order to carry such a program, the scope of this study has been narrowed to a limited area of industrial society; namely, a study of one of the representative major industries in the United States: the petroleum industry. The selection of the petroleum industry is made for several reasons: its origin coincides with the beginning of industrial expansion in the United States, it is an "American" industry, and, as much as any other industry, it is typically "big business".  

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4 This phrase has reference, of course, to the ponderous, corporate structure of industry, to absentee ownership, and to the concentration of financial control exercised through the media of holding companies and interlocking directorates; it refers to the methods of mass production under the direction and supervision of technically trained management; to the minute specialization of tasks that all but reduce the worker to a human automaton; and to an industrial system in which opportunity for advancement to the directorship or ownership of business from within the ranks has practically disappeared.
Born during the era of rapid industrial expansion, generally accepted as beginning around 1850, the origin of the petroleum industry is dated from the first oil well drilled for commercial purposes in 1859. It is a product of the laissez-faire era of rugged individualism and ruthless competition. Unlike other important American industries such as textile, shoe, and iron and steel industries, the petroleum industry has had no European predecessor. The major discoveries of science and technology in all branches of the petroleum industry have been largely the products of American scientists and engineers.

The petroleum industry has grown exceptionally fast. It was the first American industry to be successfully

5 "Petroleum was originally produced in Russia commercially by very primitive methods as early as 1821, but it did not become of economic importance until almost a half century later, with the introduction of scientific and efficient American production, refining and transportation methods." David Leven, Done in Oil (New York: The Ranger Press, Inc., 1941), p. 224. The first oil well was not drilled in Russia until 1871, previous to which oil was obtained from hand-dug pits. G.D. Hobson, "U.S.S.R.", The Science of Petroleum (Vol. I.), (London: Oxford University Press, 1938), p. 155. "As early as 1823 the brothers Dubinin erected a refinery in the village of Wosdek" (Russia) which distilled crude Caucasian oil for use as an illuminant. Cf. Sir Boverton Redwood, A Treatise on Petroleum (Vol. II), p. 476; also pp. 556-559, and Ibid., Vol. I, pp. 3-10. These methods of refining were rather crude and production was on a rather small scale. The first large scale use of refining processes for the distillation of crude petroleum was developed in the United States following the drilling of the Drake well in 1859.
controlled by a monopoly,⁶ and today the refinery branch is
ranked fourth among the leading manufacturing industries in
the country,⁷ and, in 1939, the assets of the largest oil
company were the second greatest among the 200 leading non-
financial corporations.⁸

If the limited scope of this study provides the back-
ground for subsequent studies that will treat more in detail
the various social factors of the petroleum industry which
could be but briefly touched upon here, or, if it stimulates
interest to undertake similar studies for other industries,
then it will have fulfilled its purpose.

Method

This subsumes the existence of numerous organiza-
tions and social groups within the petroleum industry: the
economic organization of individual and collective business
enterprises, the formal and informal organizations of man-
agement and labor, and the organization of industrial rela-
tions — all these take many and varied forms throughout the
industry. Social organization as defined here represents

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⁶ The Standard Oil Trust, 1879-1911.

⁷ Ranked according to value of products the leading
industries of the United States in 1939 were: Motor Vehicles,
$4,039,931,000; Steel Works and Rolling Mills, $2,270,020,000;
Wholesale Meat Packing, $2,648,326,000; and Petroleum Refining,
$2,461,127,000. Census of Manufactures, 1939, Table 12, p.
305 f.

⁸ Raymond Goldsmith and Rexford Parmelee, Distribution
of Ownership in 200 Largest Non-financial Corporations (mono-
the aggregate of social groups within the petroleum industry, and its dynamic characteristic is derived from the adjustments made by any of the aggregate to past and present social and cultural situations in American society.

The arrangement of the main study into four divisions is purely an academic one, devised largely for the purposes of providing clarity and continuity to the descriptive analysis of this very broad and complex subject. Because the importance of the petroleum industry in modern society has been of such recent origin and has come about so rapidly, a brief socio-historical perspective of the industry is first presented in an analysis of the petroleum culture complex.\(^9\) Without such a perspective it would be exceedingly difficult to comprehend the degree to which the petroleum industry has effected phenomenal cultural changes in the economic and social life of America, and, in turn, has been itself affected by these changes. The study then describes the effect of natural and cultural environments upon the economic structure of the petroleum industry: its location, size, integration, and concentration of control. Since the study primarily is interested in the organization of human relationships within the petroleum industry, the following two parts are devoted

to an analysis of the human factor, or labor force. Its com-
position, size, socio-economic distribution, and some of the
principal petroleum occupations are analysed and described,
following which there is an analysis of the manner in which
management and labor are organized principally for the pur-
pose of collective bargaining.

Information and data for the study have been gathered
from numerous sources. Almost limitless statistical and
written materials dealing directly or indirectly with each
of the chapters in the study were available. Whenever it
was possible and feasible to do so, original source materials
were consulted, and those sources most pertinent to the
topics included in the study have been listed in the selected
bibliography.

Supplementing the great volume of published material,
first hand information and verification of technical details
were obtained from visits to oil-fields and the large Esso-
Standard refinery at Baton Rouge, Louisiana. Other sources
of information included a number of personal interviews and
correspondence with persons associated with various phases
of the petroleum industry: oil-field men, refining personnel,
faculty members and graduate students in the School of
Geology at Louisiana State University, representatives of the
Oil Workers International Union, the Congress of Industrial
Organization, the Independent Industrial Workers Union of the
Despite the plethora of literature about the petroleum industry, there is a dearth of written material concerning its social aspects. By far, the greater part of the literature pertains to the technical phases of the industry: the geographical distribution of crude petroleum resources, the nature and location of favorable geologic formations, methods of exploration, the amount of crude oil production and refining capacity, the physical and chemical properties of crude petroleum, problems of transportation and storage, and the developments in the techniques of drilling and refining.

Next in quantity are the large number of books and articles about petroleum industry economics. These writings range from the scathing denunciation of monopolistic practices of the industry by Ida Tarbell to the numerous investigations... while a lot of information on operational development is available on the oil industry, very little information on sociological effects or developments caused by the finding of oil has been recorded." From a letter addressed to the writer by Mr. Fred Van Covern of the American Petroleum Institute.

A rather complete bibliography of these technical writings has been compiled by Everette E. DeGolyer and Harold Vance, Bibliography on the Petroleum Industry (Experimental Station Bulletin No. 83, Fourth Series), (College Station: School of Engineering, Texas Agricultural and Mechanical College, September, 1944).

of its economic policies by various federal agencies,\(^{13}\) perhaps the most comprehensive investigation being that by the Temporary National Economic Committee during 1939.\(^{14}\) While Miss Tarbell's book was never intended to be impartial, it has become one of the most frequently quoted books on the activities of Rockefeller and his associates. A more unbiased and comprehensive coverage of the monopolistic practices of the industry during the days of the Standard Oil Trust is found in the reports of the Commissioner of Corporations.\(^{15}\) The hearings before the Senate Temporary National Economic Committee were not primarily for the purpose of investigating the petroleum industry but were a general inquiry into the concentration of economic power in American industry and its effect upon competition. However, that part of the hearings pertaining to the petroleum industry filled more than 3,000 closely printed pages and comprises six volumes of the committee's report.\(^{16}\) A summary of the testimony relating to

\(^{13}\) See Appendix, Table 8, for list of principal investigations.


the concentration of control in the petroleum industry by a few of the larger oil companies has been presented in a monographic study by Roy C. Cook. Another important congressional investigation recently centered its attention upon the effect that production and marketing practices of large integrated oil companies have had upon the smaller independent petroleum concerns.

In general, the economic studies of the petroleum industry tend to follow a similar pattern. Almost all of this literature contain sections on the discovery of crude oil, the early history of the petroleum industry, the eventual rise and fall of the Standard Oil Trust, the advent of modern technology, and sections on the various branches of the industry. Some stress one or more of these topics. Excellent accounts of the early years of the industry are given by Bacon and Hamer, Giddens, White, and Fanning, and


recently the American Petroleum Institute has published brief historical resumes based upon such studies. 20

Ise, Watkins and Stocking 21 emphasize the problem of waste in crude petroleum production and the need for conservation measures; they also give some attention to the controversial issue of government control of the industry.

Shuman, DeGolyer, Pogue, Fanning, and Hager 22 among others, represent the more orthodox economic studies. The subjects usually discussed are the character of the petroleum industry, the demand for crude petroleum and its products, the development and production of crude oil, refining and manufacturing, the transportation and storage of oils, marketing petroleum products, financial policies and investment considerations, taxation of the petroleum industry, international oil trade, conservation and control of petroleum production. As Shuman says, "This study does not pretend to be more than a survey; it does not purport to be an


encyclopedic gathering together of all data; nor does it represent an attempt to duplicate the many primarily historical studies of the petroleum industry which trace, in large detail, the early development of the field, frequently laying heavy stress on the activities of the old Standard Oil Company."  

Two of the principal attempts to present an encyclopedic report such as that referred to by Shuman are the works of Leven and a large group of experts under the editorship of Dunstan. Except for a brief description of drilling occupations and a section on the number of persons in the petroleum labor force included in Leven's book, no consideration is given to the social aspects of the industry.

Several annual publications are devoted entirely to the presentation of statistical data covering every phase of the petroleum industry. In addition to these publications,

23 Shuman, op. cit., p. vii.
24 David Leven, Done in Oil (New York: Ranger Press, 1941).
there are the government and trade journal publications which also published considerable statistical material at more regular intervals, and the Bureau of Labor Statistics has published several bulletins covering the wages and hours of petroleum industry workers.

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27 U. S. Bureau of Mines (Monthly Petroleum Statements with Annual Summary), U. S. Geological Survey (Bulletins containing petroleum data relative to Government and Indian lands), U. S. Bureau of Census (Biannual report of Census of Manufacturing contains data on petroleum refining), Interstate Commerce Commission (publishes information on petroleum transportation), Federal Trade Commission (issues special reports on petroleum investigations and trade practices); Oil and Gas Journal (weekly publication of petroleum news and statistics), Oil Weekly (weekly publication of petroleum news), World Petroleum (Monthly, petroleum news and statistics). There are more than 60 trade journals appearing regularly (Cf. Leven, op. cit., p. 1035), and many of the leading companies and the American Petroleum Institute publish regular periodicals.

In recent years there has been a trend toward the publication of books written in non-technical language which are designed to acquaint persons outside of the petroleum industry with the development, organization and technical aspects of the industry. One of the best of this type of literature is by Max Ball, This Fascinating Oil Business. 29 Others have been those which have dealt with a particular phase of petroleum industry activity. Tait, "who was literally born in a derrick", has written of the glamour and fascination "which have inspired men with the zeal to search for petroleum in far away and lonely places". 30 Forbes 31 gives a lucid and vivid description of the development of the oil industry in the Southwest. Wilson 32 tells the story of pipeline transportation, and Debo 33 gives a picturesque and interesting picture of an unidentified but typical boom town in the oil regions of the Southwest.


Throughout all of this literature there is only slight mention of the social aspects of the industry. Ball devotes a chapter of his book to a very general description of various petroleum occupations; Forbes and Tait each have a chapter on the social and economic influences of the petroleum industry on a community located in the oil regions. But aside from these relatively few references, the literature about the petroleum industry is almost entirely in terms of economic conditions and problems, or about the technical nature of petroleum operations.

No comprehensive study has yet been published which views the dynamic character of the industry as a sociological phenomenon. For that reason, this study has drawn upon the heterogeneous sources of petroleum industry literature and has attempted to incorporate some of the more sociologically significant data into a systematic study of the industry. It cannot be claimed, nor is such an impression intended, that all the available literary sources have been thoroughly culled of their sociologically relevant material. It is not likely, however, that important sources have been

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34 Ball, op. cit., Ch. II, pp. 20-47; Forbes, op. cit., Ch. IX, pp. 159-171; Tait, op. cit., Ch. XIII, pp. 150-159. See also, J. K. Johnson, "Borger, The Natural History of an Oil Boom Town", Studies in Sociology, IV (Winter 1939), 3-10, Southern Methodist University; Walter D. George, "Boom Towns of Other Days Recalled by Pioneer Driller", Oil, I (February 1941), 35.
Neither has it been possible, although it would be very useful, to make an intensive review of the literature concerning other major industries. A rather careful survey of such literature, however, likewise has failed to reveal a study such as this one for any of the principal industries in the United States. There have been a number of community and industry studies related to the shoe, textile and mining industries, and a few descriptive studies about the lumber and other industries, but, to date, no single large industry has been studied from the viewpoint of social organization.

In view of the fact that this thesis suggests a

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rather broad approach to the study of industry through a description and analysis of economic institutions as social organization, consideration will now be given to some of the more recent developments in the field of industry studies and to some of the thinking and writing now current among an increasing number of sociologists about the so-called field of industrial sociology.

The paucity of sociological literature, not only about the petroleum industry but other industries as well, in part is due to the persistence among modern industry and business leaders to consider their internal affairs as strictly private and to resist any scrutiny by "outsiders."37 When viewed as a culture product of the laissez-faire doctrine of the "natural right" of every enterpriser to conduct his own business as he saw fit, such an attitude is understandable. As a culture trait this attitude has been difficult to change as is evidenced by the insistence upon the part of those who own or manage the affairs of business and

37 "It must be remembered that factories are social organizations with walls around them. Management controls the admission of people within these walls, and there is no access without such permission. Furthermore, management tends to be touchy about exposing its personnel problems to outside scrutiny and fearful of the effects of permitting outsiders to enter the organization." Cf. Burleigh B. Gardner and William F. White, "Methods for the Study of Human Relations in Industry", American Sociological Review, XI (October 1946), 506.
industry to describe their activities in terms of "free" or "private" enterprise. The apparent lack of sociological research in industry in part may be due also to the opinion held by industry and business leaders that sociology is more of a theoretical than an applied science. Traditionally, the viewpoint of industry and business has been that industrial research is of value only if it is conducted chiefly from the point-of-view and for the purpose of increasing operational efficiency. That the attitudes of workers and their social behavior in informal work group were important to the production process has been viewed perhaps as unrealistic and impractical theorizing. Thus, in the past, investigations in the field of industry research have been left largely to the economist, the industrial psychologist, or the production engineer. The results of their scientific research are considered more "practical" especially when they can "prove" statistically the causal relationship between increased worker output and such factors as selective employment practices, improved efficiency due to the elimination of waste motion, or to changes in the physical work environment.

Interest in the use of scientific methods in the field of industrial research first developed with the increased use of technological machinery in America during and following the first World War, and with the violence that accompanied labor unrest in the early years of this
This interest led to what the writers of that era called the new spirit of industry. "A new spirit is abroad. Production, distribution and consumption are being evaluated in terms of the kind of men which the processes produce. Production of things is becoming recognized as subservient to the production of capable and morally responsible men... the 'commodity theory' of labor is discredited by modern workers, and by modern-minded employers as well."38

Two important developments grew out of the need for labor to increase its tempo because of machine technology. First, attention was directed toward the development of a system for increasing the efficiency of the workers through such devices as time-and-motion studies. Operational processes were timed for the purposes of eliminating waste motion and for finding the most "efficient" method of performing a certain operation.39 Associated most prominently with this system, often referred to as "scientific management", was


Frederick W. Taylor. Interest in this field developed rapidly, the followers of Taylor established the Taylor Society, and the Bulletin of the Taylor Society was published regularly. Throughout the twenties scientific management of industrial relations and the "efficiency expert" became familiar; psychologists and personnel managers began to study and to write about the means and methods of increasing human efficiency by a more selective process of personnel employment and testing of job performance. The scientific method of measuring and evaluating worker performance became the accepted and standardized procedure in many of

40 Taylor conceived a plan by which workers would be under the supervision of foremen specialized in a particular operation, with an administrative department for planning and coordinating all activities. This department was to be staffed by experts who were to issue specific and detailed instructions as to the manner in which certain operations were to be performed. Cf. Frederick W. Taylor, The Principles of Scientific Management (New York: Harper & Bros., 1911); H. S. Person, editor for Taylor Society, Scientific Management in America (New York: Harper & Bros., 1929); also, Carroll R. Daugherty, Labor Problems in American Industry (New York: Houghton-Mifflin Co., 1941), Ch. XVII, pp. 569-591; and Wilbert E. Moore, Industrial Relations and the Social Order (New York: Macmillan Co., 1947), pp. 178-187.


The new interest in industrial relations has developed already an extensive literature. It is less concerned with dreams and hopes, or with contending industrial theories, and more with records of actual human contact, in shop, mill, mine, factory and store, and with experiments in adjusting human relations...Whatever the future may hold, whatever changes it may bring to industrial relations, the knowledge gained by scientific methods must remain the only safe guide to action.”

The second important development was the rise of various experimental plans designed to reduce the extent of labor unrest, and presumably to give the worker an opportunity to meet with management concerning matters of wages, hours and conditions of work. One of the first plans was that of the employees' representation plan for the Colorado Fuel and Iron Company instituted by John D. Rockefeller, Jr., in 1916 following a disastrous strike in the Colorado coal fields.

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45 Ben M. Seleman and Mary van Kleek, Employees' Representation in Coal Mines (New York: Russell Sage Foundation, 1924).
Similar plans were also adopted for the petroleum and steel industries. Growing out of the need for continued and increased production for World War I, John Leitch of the War Labor Board introduced a novel form of employee representation organization: the so-called "Leitch" or "Industrial Democracy" plan which was patterned after the government organization of the United States. The growth of these employee representation plans spread very quickly during 1919-1926, and as early as 1927, in publicizing these plans, the United States Chamber of Commerce wrote, "All production, whether by mechanical means or otherwise, is controlled by the human factor which is our most important problem..." (the problem) of human relations in industry.”

46 For the development of the employees' representation plan in the Standard Oil Company see, John D. Rockefeller, Jr., The Personal Relation in Industry (New York: Boni & Liveright, 1923), and Clarence J. Hicks, My Life in Industrial Relations (New York: Harper & Bros., 1941).


48 For a description of the various employee-representation plans, including the Leitch plan, see Employee Representation or Works Councils, Department of Manufacture (Washington: U. S. Chamber of Commerce, 1927); See also: John Dewey et al., Thirty-five Years of Educational Pioneering. L.I.D. Pamphlet Series (New York: League for Industrial Democracy, 1941); and Economics of Defense and Reconstruction, Proceedings of the Twenty-seventh Summer Conference of the League of Industrial Democracy, June 20-22, 1941, L.I.D. Pamphlet Series (New York: League for Industrial Democracy, 1941).

49 From 1919 to 1926, the number of works councils or employee representation plans grew from 196 to 913, with a corresponding growth in the number of workers covered by these plans from 400,000 to 1,400,000. Ibid., pp. 5-6.

50 Ibid., inside cover.
These early developments in the consideration of the human factor in the productive process of economic activity — fitting the worker to the job, and the organization of relations between management and labor — have served as background material and have influenced the increasing amount of attention devoted to industrial literature of the past two decades. More and more the social scientists have been consulted or have been employed to conduct intensive research into ways and means by which the human factor of labor could best be adjusted to the technological processes of mass production.

The facilities of some of the larger universities have been utilized and partially subsidized by economic interests for the purpose of carrying on scientific industrial research. The Department of Industrial Research at Harvard University has a special research committee on industrial physiology for directing "research into effort and fatigue in industry and into the industrial efficiency of individuals."51 Yale University has its Institute of Human Relations for the "scientific investigation of some of the important problems of social and economic welfare, among them human problems arising from technical progress in industry";52 while at the


University of Chicago the recently formed Committee on Human Relations in Industry "is primarily concerned with the scientific study of the social relations of human beings in economic institutions, and with the investigation of the behavior of the individual members of these systems". Princeton University and the Massachusetts Institute of Technology also have similar Industrial Relations Sections. The research of these academic organizations is usually on a cooperative basis with participating members from the departments of business administration, economics, anthropology, and more recently, from sociology. Outside the educational institutions there are such organizations as the Russell Sage Foundation and the National Industrial Conference Board which also carry on extensive research programs.

The literature concerning the industrial aspects of modern society, for the most part, is concerned with those


56 Industrial Relations in Small Plants (1939) and Industrial Relations -- Policies and Programs (New York: National Industrial Conference Board).
economic activities associated with the production of goods and services.\textsuperscript{57} The growth of the large industrial concern with its dependency upon modern technology and corporate finance has widened the scope of the early inquiries into industrial life. One of the most comprehensive and often quoted studies is that undertaken by the Harvard school under the direction of Elton Mayo. These studies which have had the full cooperation of management and which have extended over a period of some sixteen years were originally planned to study the "relation of the quality and quantity of illumination to the efficiency of industrial workers."\textsuperscript{58} When the results of this experiment produced results "quite different from what had been expected"\textsuperscript{59} other experiments were devised in an attempt to study the productivity and efficiency of a small group of workers under controlled conditions of work that were altered from time to time throughout the various stages of the experiment. While no mention is made of the former studies of Huntington and his associates relative to the output of factory workers under varying climatic conditions,\textsuperscript{60} the Harvard observers undoubtedly expected


\textsuperscript{58} Roethlisberger, \textit{Management and Morale}, p. 9.

\textsuperscript{59} \textit{Loc. cit.}

\textsuperscript{60} Ellsworth Huntington, \textit{Civilization and Climate} (New Haven: Yale University Press, 1924); E. G. Dexter, \textit{An Empirical Study of the Mental and Physiological Effects of Definite Meteorological Conditions} (New York: Macmillan, 1904).
that under varying conditions of illumination, temperature and so forth, variations in the productivity and efficiency of the worker-group could be expected. But when the vast amount of scientifically observed and recorded data were analysed, on which "a skillful statistician spent several years ... (there was) not a single correlation of enough statistical significance to be recognized by any competent statistician as having any meaning." All that the experiments proved was what sociologists for a long time had known, that the worker reacts to a situation in terms of his definition of the situation. The "new illumination, that came from the research ... (was) in most situations the meaning of a change is likely to be as important, if not more so, than the change itself ... that the behavior of workers could not be understood apart from their feelings or sentiments."

Both Mayo and Roethlisberger seem unaware that their experiments have only confirmed the sociological phenomenon of dynamic informal group relationships. While they repeatedly have drawn sociological interpretations from their

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61 Roethlisberger, Management and Morale, p. 9.


63 Roethlisberger, Management and Morale, pp. 15, 19.
findings concerning the "morale" of their work-group experiment, Mayo naively refers to sociology as being "highly developed, but mainly as an exercise in the acquisition of scholarship. Students are taught to write books about each other's books... little is said of sociology in the living instance, sociology of the intimate, nothing at all. Indeed, in respect of those social personal studies that are becoming more important year by year, no continuous and direct contact with the social facts is contrived for the student." 64 Although Mayo discusses the works of LePlay and Durkheim as to the importance they placed upon the effects of industrialization upon community life in general, 65 he and his associates have entirely overlooked that phase of industrial social inquiry which is acutely aware of the interdependence of social behavior within and without the confines of the industrial plant itself. Social relations are defined in terms of the system developed by management to carry out its productive program. 66 The summary of these studies fails to perceive the relationships of the small experimental group as only a part of the aggregate social system in the industrial

64 Mayo, op. cit., p. 20.
65 Ibid., p. 5.
66 Roethlisberger, Management and Morale, p. 192.
organization, and very little discount is made for the fact that the work group observed becomes a special group when set apart from other such groups, even for the purposes of scientific investigation.67

Following the pattern of the Harvard school, the Chicago group has set up a similar though much less pretentious program for investigating "human relations in industry".68 The chief shortcomings of such studies lie in the fact that they are narrowed down to a small unit of a shop, or work group that fails to give any significant sociological picture of the complicated and dynamic system of social relations within the total social structure of the plant, nor do they show the interdependence of the social life and behavior of the workers within and without the environment of the industrial plant.

Another type of industrial study, one of the best of which is that by Warner and his associates,70 is that of the industrial community. In The Social System of a Modern Factory, Warner and J. O. Low provide a social analysis of a

67 For a more critical review of Mayo's work, see book review by Wilbert E. Moore, American Sociological Review, XII (February 1947), 123.


strike of seven shoe factories in the Massachusetts town of Newburyport whose population is largely dependent upon the shoe industry for its employment. The detailed analysis presented attempts to show that factors more social than economic gave rise to a community resentment that brought about the strike in 1933. Chief among the prominent factors are the change from local ownership to absentee ownership and control, the importation of technically trained personnel, and the changing technology of the expanding industry. These factors have resulted in a more impersonal relationship between management and labor, fewer advancement opportunities for the average worker in the skill hierarchy, and a lowering of the status of workers in the community social structure.71 While the study is very well done and presents an interesting sociological analysis of status relationships in the changing social structure of the community, the causality of these changes appears too directly associated with the changing technology of the shoe industry without adequate reference to the


71 Warner and Low, Social System of Modern Factory, pp. 190-192.
Influence of modern technology upon the larger society of which this one community is a part. Another weakness of the study is the failure to analyse the shoe industry in terms of social organization and to relate the dynamic relationships within the industry to those of the community outside the industry plants. It lacks a concept of social organization which would serve both industry and community whereby could be studied the change in a manufacturing process which "runs through an unbroken continuum of human relationships, all the way from those uniting engineer and supervisor and worker through those uniting worker and worker out into those uniting the worker and his representatives, the worker and his priests, the worker and his family." 72

In addition to studies of the worker while on his job in the industrial plant and those of the industrial community, the growth of the industrial unions and the guarantee of their rights to collective bargaining under the provisions of the Wagner Labor Relations Act of 1935 73 have brought forth a considerable amount of literature pertaining to the nature

72 Conrad Arensberg, "Industry and the Community", The American Journal of Sociology, XLVIII (July 1942), 7.

73 These rights and privileges have been modified somewhat with the recent passage of the Taft-Hartley Act, amending the Wagner Act.
and problems of labor relations.\textsuperscript{74} Closely associated with the problems of collective bargaining is the manner in which the organizational structure and the procedures for handling grievances of the large trade unions have paralleled the hierarchical line of authority of the large industrial concern. This parallelism of organizational structure has led some into a rather untenable position of ascribing to the large labor union organization the characteristics of bureaucracy. "The modern industrial structure represents the meeting of two bureaucracies -- the corporation and the union".\textsuperscript{75} Neither size nor structure of the social organization is sufficient criterion for designating it "bureaucratic"; bureaucracy is a form of administrative staff rather than an organizational structure, although the latter is essential to the former.\textsuperscript{76} The fact that many modern corporations are tending to develop organizations patterned along lines of bureaucratic administration has occasioned sociologists and others to study the nature and the effect of bureaucracy.\textsuperscript{77}


\textsuperscript{75} W. E. Moore, "Current Issues in Industrial Sociology", p. 657.

\textsuperscript{76} Cf. Max Weber, Essays in Sociology (tr. by H. H. Gerth and C. Wright Mills), (New York: Oxford University Press, 1946), Ch. VIII, pp. 196-244.

\textsuperscript{77} Philip Selznick, "An Approach to a Theory of Bureaucracy", American Sociological Review, VIII (February 1943),
The bureaucratic features of the larger economic institutions and their close association with modern technology have merely emphasized what earlier writers already have pointed out: the importance of considering the effect of technological innovations upon the human factor in industrial relations. Labor problems, however, no longer are simply maladjustments between management and labor in a particular shop, mill or plant; they are social problems that may, and often do, affect the social life of the entire community. Furthermore, problems of labor are no longer considered to be the products only of economic motivations but increasing attention is being given to psychological and social factors. The dynamic quality of the relationships


between labor and management, particularly between large international labor organizations and huge industrial corporations, "may be regarded as in a state of continuous tension". These relationships may be affected by public opinion, by technological changes, by political alignments, by legislation and judicial decisions. In short, they are intrinsic to the social behavior of society within and without the industrial plant. They constitute what Blumer considers the dynamic area of industrial relations.

This concept of industrial relations, the interaction between management and labor, is not accepted by all who are engaged in industry research and study. The Harvard and Chicago schools that emphasize "human relations in industry" tend to narrow the concept to the social interaction among persons in an industrial plant, especially as observed among small informal work groups and as affected by the formal status and role of the worker. "In industry, the boundaries of the social system are clearly defined, and skillful


81 Cf. Ibid., p. 272-273.

interviewing and observation can give us a relatively complete record of the sequence of interaction from the boss down, from the worker up, and through the various staff organizations.\textsuperscript{83} Blumer would argue that such a concept is deficient because it identifies human relations with cultural or structural relations which "is inaccurate and misleading".\textsuperscript{84}

Moore, who is in agreement with Blumer in the latter's criticism of the "structural-functional approach",\textsuperscript{85} is of the opinion that Blumer, on the other hand, has assumed "a quite unacceptable constriction of the field to the study of management-labor relations."\textsuperscript{86} It is the contention of Moore that since the internal relationships, those between management and labor, are partly modified by the position of industry in the larger society, industrial relations should include "the whole network of organized activity that constitutes the productive system."\textsuperscript{87}

\begin{footnotes}
\item[84] Blumer, op. cit., p. 275.
\item[85] W. E. Moore, "Current Issues in Industrial Sociology", p. 652.
\item[86] Ibid., p. 651.
\item[87] W. E. Moore, Industrial Relations and the Social Order, p. 5.
\end{footnotes}
Throughout the current literature on industry studies there is general agreement, of course, concerning the dynamic quality of human relationships within the industrial social organization, but what is also apparent is the confused thinking concerning the role of the sociologist in such studies, and the vague suggestions on how to approach them. It is not sufficient to view with misgivings the "faddish character of interest in Industrial Sociology" nor to be so critical of work already done by other social scientists in the field of industrial research. It is suggested here that, in a large measure, much of the confusion stems from the failure of sociology to make use of its scientific discipline and its present body of knowledge.

Technology, as ancient as man himself, has always been a catalyst to societal change, and the rapidity of social change under the impetus of modern technology which has resulted in the emergence of American culture as a full-fledged industrial society should hardly have been unexpected and have found the sociologists so unprepared. "We need a scheme of treatment suited to the analysis of collective and mass interaction ... I do not believe the sociologists have yet begun the task." To argue that "social scientists are

88 Blumer, op. cit., p. 272.
89 Ibid., p. 278.
challenged to move with all possible speed toward a comprehensive and enlightening industrial sociology”⁹⁰ is to admit sociologists until now have been unaware of the necessity for observing, analysing and interpreting societal changes arising from the culture complex of modern technology. This belated awareness cannot, and should not, be assumed to justify the need of a new and unexplored field for which there must be developed new techniques and methods of research and investigation. If sociology is at all a science, then its theories, principles and research should be tested for their validity and reliability as they are applied to the study of industrial society. It may be necessary to modify certain sociological precepts, but it is questionable whether it is necessary or desirable to define and delimit another specialized area of sociology. It might well be asked, where would the line be drawn, for example, between urban and industrial sociology?

One approach to the study of industrial society is that undertaken by Moore in his book, Industrial Relations and the Social Order. In view of the purpose of the book to view modern industry "as a complex social organization and pattern of relations",⁹¹ the title is somewhat misleading.

⁹⁰ van Kloosk, "Toward an Industrial Sociology", p. 501.

⁹¹ W. E. Moore, Industrial Relations and the Social Order, p. vii.
However, this pioneering attempt to relate the internal structure of industry to the larger society with which it is in constant interaction provides ample opportunity for the writer to "utilise available knowledge of social organization and social relationships for an understanding of industrial life and its relationship to the community." The vast scope of the study has its shortcomings in that it has been impossible to present sufficient practical and illustrative material to bulwark the wide range of theoretical considerations included in the text. At times the reader feels undue emphasis is given to theoretical problems quite beyond the importance they warrant in relationship to industrial relations; for example, the discussion of the growth of professional management is devoted almost entirely to a theoretical analysis of the nature of the corporate structure. In the main, the author has succeeded in presenting a description of "industry as a whole: as a functioning organization made up of persons in various official and unofficial relationships, and as an organization which is in some way or other related to other organizations, to the community, and to society as a whole." He deals,

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92 Ibid., p. 4.
93 Ibid., Ch. V., pp. 71-91.
94 Ibid., p. 5.
however, with industry as that which denotes "the orderly production of goods, as distinguished from financial and commercial activities." While this limited concept of industry serves its present purpose, the sociologist would do well to be on guard lest he be caught "short" again by his failure to recognize the impact and influence of technological progress upon all forms of economic activity: agricultural, commercial, financial, and mining, as well as those primarily concerned with manufacturing and mechanical activities. The growth of large trade and industrial union organizations has also been accompanied by the mass organization of railroad, mine, communication, and clerical workers.

The economy of contemporary American culture is such as to be conducive to large-scale organizations in all branches of economic activity. Since it would be helpful to develop a conceptual scheme of social organization that would provide a more uniform approach to industry studies and that would make possible valid comparisons between various types of social organizations in an industrialized society, this study presents such an initial attempt in its descriptive analysis of the social organization of the petroleum industry.

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95 Loc. cit.
PART II

THE COMPLEX OF PETROLEUM CULTURE
CHAPTER 2

THE DEVELOPING PETROLEUM CULTURE PATTERN

"All culture, and consequently all economy is historical...
The task of all cultural sciences is to find ways and means by which to grasp cultural phenomena in their historical singularity..."1

Crude petroleum, found in rocks at or beneath the surface of the earth, is a dark, sticky fluid; it is the raw material upon which the petroleum industry is dependent. Despite its unpleasant physical characteristics, it is perhaps one of the most desired and sought after of all the natural resources. Often it is referred to as "Black Gold", and in the struggle to profit from the riches which its discovery brings, fortunes have been won and lost overnight; "boom towns" have appeared and disappeared in magical succession; and it is no product of fanciful imagination to imply that, in the field of world power-politics today, supremacy lies in the control over crude petroleum resources. Culturally, contemporary society aptly has been called the "Oil Age".

1 Werner Sombart, "Capitalism", Encyclopedia of the Social Sciences, III(1930), 196.
Plate II

World Oil for Today and Tomorrow

Dark brown areas on the map indicate present oil-producing regions. Lighter brown areas indicate those regions where it is believed new sources of crude oil will be discovered.
The petroleum industry in the United States, with its gusher wells, towering derricks, and the popularized "boom town", is a relatively young industry, dating itself from the first commercial oil well drilled in 1859.\textsuperscript{2} There are evidences, however, that crude petroleum was used by the Indians for hundreds of years before this country was settled by the white man. Some oil historians have stated that the original sumps and pits from which the Seneca Indians collected surface oil appeared to be the work of a culture earlier than that of the Seneca Indian.

"And these old oil pits were carefully prepared, frequently lined with timbers, and resemble the work of people, whoever they were, who mined copper near Lake Superior. Many of the sumps were covered by trees, several feet in diameter, when they were first seen by white men - which testifies to their antiquity. The Indians were more inclined to depend on oil springs and surface seepages. We have no idea now who these ancient people were, but we have strong evidence that the eastern oil fields were yielding their products hundreds of years ago, and on a more extensive scale than they were when the white man first penetrated the region."\textsuperscript{3}

\textsuperscript{3} \textit{Burning Rivers}, p. 2.
Obviously, the importance of a natural resource to society is dependent upon the cultural development of the people who discover it. Although numerous oil seepages had been observed in many places throughout the country, and the technique of drilling had been developed in the salt-brine industry as early as 1807, it was not until many years later, well into the nineteenth century, that crude oil was found to be of commercial value, and the two were associated with each other.

It is true, of course, that a limited business was developed by Samuel Kier who distilled some of the oil from surface seepages and bottled his product which he called "Kier's Oil". It was widely advertised as an infallible "cure-all". But, generally, crude oil was considered a very undesirable nuisance.

Not infrequently, drilling operations for salt and water would be discontinued and abandoned as total losses

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because traces of oil were found in the water or salt-brine. 6 Occasionally, oil pools were penetrated and the flow of petroleum was so great it was allowed to overflow over miles of the surrounding territory until eventually it found its way into some stream. On several such occasions in Kentucky and Ohio, the flowing oil caught fire as it moved downstream, and the awesome spectacle of a burning river provided the people of the area with a topic of conversation for many days. The story is told of one such incident in Cumberland, Kentucky, where a salt well was being drilled:

"At a depth of 180 feet the bit hit oil sand, and crude oil poured out of the well and onto the ground. It flowed by heads for several weeks; then settled down to a steady production - all of which was allowed to pour into the Cumberland River. The flow covered the whole surface of the river, caught fire, and traces of it were found on the Cumberland as far as Gallatin, Tennessee, a hundred miles away." 7

This unusual event occurred in 1829. Today such an uncontrolled and unchecked flow of crude oil may appear to have

6 "Here was a well bored for salt to the depth of 600 to 800 feet - the average of later petroleum wells in Pennsylvania - producing scarcely anything but petroleum, every well in the region throwing up more or less oil, and yet it seems never to have occurred to anyone that if bored expressly for it, it could be found in paying quantities." Fuchs, op. cit., p. 49.

7 Burning Rivers, p. 3.
been an inexplicable waste of a valuable resource, but it must be remembered that what was wanted and needed was salt, not crude oil.

Until the middle of the nineteenth century, sperm oil remained the principal source of supply for lubricants and illuminating oil. The dependency of society upon sperm oil then was not unlike the dependency of modern society upon crude petroleum and its derivatives today. Although castor oil and some vegetable oils were used to a limited degree, the supply of sperm oil was so plentiful it was generally believed unlimited. Probably very few persons foresaw the day when the supply of whales would be depleted, and perhaps even fewer, who believed an adequate substitute could be found; thus, there was little or no incentive to consider crude oil as a possible source of lubricating and illuminating oils.

However, the far-reaching changes in the social and economic life of American society during the first half of

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8 "At Amaino, in Italy, the petroleum of a spring discovered within a few years is employed to light cities ...It might be of considerable importance to discover whether the petroleum of our spring might not be of beneficial purposes." (Reference to an address by DeWitt Clinton to the New York Philosophical Society in 1814 concerning the Seneca Springs in Allegheny County of Pennsylvania). D. White, "Outstanding Features of Petroleum Development in America", Bulletin of American Association of Petroleum Geologists, XIX (April 1935), p. 482 f.
the nineteenth century made creative demands upon the sperm oil industry. With the turn of the nineteenth century, the frontiers of the country had been pushed farther to the West and Southwest, into regions that later were to play an important role in the historical development of the petroleum industry, and, by 1860, the population was nearly five times that of 1800.9

As the westward movement of the population gained momentum, the facilities of rail and water transportation were improved and extended. Industry also expanded and moved nearer the consumer markets of the new West. The steam-boat, the Bessemer furnace, the locomotive and the mowing machine already were in their early stages of development, and many more mechanical inventions and scientific discoveries were in the offing.10

By 1840, the needs of the people for illuminating oil, and those of an expanding factory for greater quantities of lubricating oil made serious demands upon the sperm oil industry. Not only were these demands exceeding the

output of the sperm oil, but sperm oil was proving to be less satisfactory for the heavier and faster moving parts of the machines being installed in the factory. Even more serious, the supply of whales became very scarce. The whalers, seeking to find greater quantities of whales, often sailed thousands of miles into the Pacific Ocean only to find their efforts discouragingly unprofitable or fruitless.

Without the necessary technological skill and scientific knowledge to capitalize upon the valuable properties of crude petroleum, unsuccessful experiments were made to mix sperm oil with crude oil seepages. Other attempts to burn crude oil for illuminating purposes were abandoned because of the smoke and unpleasant odor.11

Persistent research efforts, stimulated by the continued decline of the whaling industry, eventually discovered a process for distilling a light oil from coal and oil shales.12 The product of this process was kerosene, or as it was popularly called, "coal oil". It could be used both for an illuminant and as a light lubricant, but, as a substitute for sperm oil, it did not find universal acceptance. It was a very expensive product, selling for about

11 Shuman, op. cit., p. 6.

thirty or forty dollars a barrel,\textsuperscript{13} and, as a lubricant, it was too light to combat the friction of heavy and fast moving parts of the industrial machines. Nevertheless, the demand was so great, that by 1855, seventy-eight plants were producing coal oil in the United States.\textsuperscript{14} The facilities of the coal oil industry were unable to produce either the quantity or the quality of the lamp and lubricating oils required. Had not the demand for these products been so insistent, it might have been possible for the coal oil industry to have developed its processes, similarly as was done in Germany following the first World War through the hydrogenation of coal,\textsuperscript{15} and as may have to be done in this country to avert a shortage of crude oil that now appears to be imminent.\textsuperscript{16}

However, the critical needs of the time had led two

\begin{enumerate}
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young men from New Haven, Jonathan Eveleth and George H. Bissell, to inquire into the possibility of utilizing crude oil as a source for lighting and lubricating purposes. In 1854, they gathered samples of crude oil seepages from along Oil Creek, Pennsylvania, and asked Professor Benjamin Silliman, of Yale University, to analyze them. The analysis of Professor Silliman, made in 1855, showed that the samples would readily yield kerosene and other petroleum products, and that a light oil obtained from the sample burned with an acceptable flame in the Argand burner. Bissell and Eveleth immediately organized the Pennsylvania Rock Oil Company, and, after almost three years of financial difficulties, drilling operations for crude oil were begun in June of 1859. The well, drilled on Oil Creek, near Titusville, Pennsylvania, had reached only a depth of sixty-nine feet when it began to fill with oil.

17 The following account is based upon several sources: Tait, op. cit., p. 6 ff; The Early Years (New York: American Petroleum Institute, 1944); George W. Stocking, The Oil Industry and the Competitive System; Panning, Rise of American Oil, p. 14.

18 "He (Silliman) listed the properties of both crude and distilled oil, mentioned distillation by steam, and pointed out the use of the oil as an illuminant and as a lubricating agent. 'In conclusion,' he said, 'gentlemen, it appears to me that there is much ground for encouragement in the belief that your company has in their possession a raw material which, by simple and not expensive processes, they may manufacture very valuable products.'" Paul H. Giddens, The Birth of the Oil Industry (New York: Macmillan Company, 1938), p. 30 ff; Fuchs, op. cit., p. 52.

19 "Money was tight in 1855; the reputation of Bissell
Thus, on August 27, 1859, with the successful completion of this first commercial oil well, producing twenty-five barrels a day that sold for twenty dollars a barrel, the United States entered the "age of petroleum".

The discovery of crude petroleum in commercial quantities gave birth to a new mass-production industry; it represented the transition from whaling and coal oil culture to petroleum culture. This cultural transition from animal and plant oil to "rock oil", like that from wood to iron and steel, was typical of the technological changes in the modern capitalistic society that emerged from the industrial revolution during the middle of the nineteenth century.

The latter half of the nineteenth century, 1859-1899, may very well be designated as the formative period in the

19, (Cont.) and Eveleth had become tarnished by their past promotions; the investors had begun to shy away from New York corporations because the laws there imposed unlimited liability upon stockholders. p. 10, The Early Years. While in New Haven, the partners (Bissell and Eveleth) were about to be thrown out of their hotel for non-payment of their board and room. James M. Townsend, a local banker, vouched for them and agreed to pay it...Townsend kept secret the investment he had in the company...afraid that his reputation would be damaged by association with such a risky venture." Tait, op. cit., p. 3.

20 The Drake well was drilled on what is known as Watson Flats, embracing an island at the junction of Pine and Oil Creeks, near Titusville, Pennsylvania. Cf. The Early Years, pp. 1-2.

21 Werner Sombart, "Capitalism", E.S.S., p. 195 f.
Plate III

An Oil Well Amidst Thick Underbrush
Choctaw Oil Field, Louisiana

Photo by Rosskam
growth of the petroleum industry. It was a period in which
cupidity rather than reason reigned. Thousands of people
from all walks of life rushed to the hitherto unsettled
oil regions. Knowingly or unwittingly, they often invest-
ed entire life savings in the countless speculative and
risky "over-night" oil companies.\textsuperscript{22} It was a period in
which personal fortunes were won and lost in the "twink-
ling of an eye".

It was a period of gross inefficiency and waste.\textsuperscript{23}
With no previous opportunity to learn the oil business,
the first oil men relied upon their luck and individual
ingenuity to achieve success, rather than upon their skill
and training. Inexperience and the avidity for sudden
riches added to the confusion by encouraging the reckless
abandon with which too many oil wells were drilled. Mill-
ions of dollars were lost in poorly financed enterprises
or inefficiently managed refining and drilling operations.
Untold thousands of barrels of valuable crude oil were ir-
retrievably lost because no adequate provisions had been
made for the storage and transportation of the vast quanti-
ties of oil produced.

\textsuperscript{22} Edmond Morris, \textit{Derrick and Drill} (New York: James
Miller, 1865), p. 270.

\textsuperscript{23} Stuart Chase, \textit{The Tragedy of Waste} (New York:
Macmillan Company, 1927), p. 250; George W. Stocking,
"Chaos in the Oil Industry", \textit{The Nation}, CXXXVI (June 7, 1933),
634.
It was a period of individualism. For, despite its disastrous experience in England, the philosophy of laissez-faire was very attractive to the new American industrialist of the latter half of the nineteenth century who enthusiastically endorsed and accepted it. It led to the concept of the "economic man" with the responsibility resting upon each individual to better his own condition. Governmental action that in any way would restrict competition, regulate wages, limit the labor force, or standardize working conditions was considered incompatible with the competitive economic system of private enterprise, and any such action was denounced as "interference" with the "natural rights" of the individual. The discovery of crude oil and the reestablishment of the new petroleum industry challenged the initiative and ability of the individual. It offered no guarantee of making a fortune, but, like the uncertain lottery or horse-race, it had that element - the "chance" of winning - which appealed to the optimistic spirit of the adventurer. The most "enterprising" individuals were those who made the greatest fortunes by producing the most oil in the shortest time, for the discovery of oil came during a period in which economic rather than social costs were considered the more important.

Finally, the formative period witnessed the emergence of control and order from the chaotic and confused conditions. Individual enterprise and initiative were embattled
for survival with the corporate competition of the Standard Oil Trust. It was a period in which greed, ruthless competition, and monopolistic practices became characteristically associated with the petroleum industry.

The importance of these social conditions that surrounded the petroleum industry in the United States, as it began to establish itself in the industrial life of the nation, cannot be overlooked or minimized in a social appraisal of the modern petroleum industry. With the advent of the petroleum industry, almost a century ago, the position of society was not unlike that of modern civilization as it stands at the gateway to the atomic world of tomorrow. Today, the recent scientific discoveries in the field of atomic research portend startling and historic changes on the political, economic, and social horizons of the future - changes far beyond the ability of the most vivid imaginations to comprehend. Almost a hundred years ago, society also stood at the threshold of a new world. Then, the discovery of crude petroleum as a commercial product opened the door to a vast, unknown industrial future. And, just as the problems of the atomic world of tomorrow cannot be entirely divorced from the cultural heritage that contemporary society - "the age of petroleum" - will provide, the problems of the early petroleum industry, and that of today, cannot be dissociated from the existing social conditions of the society in which it made its appearance.
The social and economic development of the society that produced the petroleum industry clearly indicated the cultural lag between the demand and need for crude petroleum on the one hand, and the woeful lack of scientific knowledge and technical ability on the other. Although it is less difficult to recognize and to appraise the economic motivations that send man out to seek and to exploit the resources of nature, nevertheless, it is an equally important consideration to understand how such motivations arise from the cultural complex of the existing society.

Economically, a more propitious time could scarcely have been selected for the beginning of the petroleum industry. It made its appearance at a critical stage in the cultural development of the United States: with the decline of the whaling industry, and the simultaneous rise of the factory system. The diminishing supply of lubricating and illuminating oils due to the exhaustion of the sperm oil supply, and the subsequent failure of the coal-oil industry to produce but a limited amount of light lubricating oils created a serious problem. The rapid

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24 It is estimated the whaling fleet of New England reached its peak around 1859 at which time it had about 600 ships totalling 200,000 tons, and the value of products of the whaling industry amounted to almost $8,000,000. Cf. Wright, op. cit., p. 382.
growth of factories and their increasing use of machine methods of production required large amounts of heavy lubricating oils, while the growing population increased the demand for illuminants.

Although the need and the demand for these products may be considered as having been the result of the economic development on an emergent industrial society, it is difficult to explain, satisfactorily or adequately, the origin of the petroleum industry only in terms of the incentive provided by this economic demand. Economic incentive is a product of culture; it can be provided only in a favorable social setting. The skills, science, and technology man devises to utilize a resource of nature for the satisfaction of his wants are also part of the cultural complex. Until a demand arises in society for a particular natural resource, the latter is of little value, either as an economic good or as a cultural trait. And as long as the supply of sperm oil remained adequate, crude petroleum was an unused and unwanted natural resource.

Culturally, there was almost a total lack of preparedness for the "age of petroleum", from the point of view of scientific and technical training and knowledge. From surface oil-seepages, and from its presence in water and salt well drilling operations, crude petroleum had been known for many years; yet the mere knowledge of its existence provided no real incentive to investigate its
commercial potentialities. There was almost no scientific knowledge about where to find oil, or how to reach its underground reservoirs. "Trial and error" drilling operations and the use of "oil smellers", "doodle-bugs", and "divining rods" were the only known methods of locating crude oil deposits.

Unlike other important American industries, such as the textile and shoe manufacturing industries, for example, the petroleum industry had no well-developed European predecessor from which labor, equipment and experience could be utilized. The petroleum industry, as developed in the United States, was "brand new". Its early years of confusion and disorder were not the result only of the lack of technical knowledge and skill. The rampant individualism of the era in which success was measured in terms of wealth, led to a replica of conditions, with modifications imposed by the nature of crude petroleum, that developed in California during the "gold rush", less than a decade earlier.

That "boom town" conditions of waste, confusion, greed, crime, over-population, and insanitation did accompany its growth has been dramatically and colorfully written.

into its history. That the petroleum industry, although bearing some scars of these deep social wounds, survived to become one of the most dominant and directive forces in modern civilization is also part of its exciting ninety-year history. There can be no adequate understanding of the modern petroleum industry without a comprehension of these social forces that so greatly influenced and stimulated its growth during the formative years of its development. In many respects, the rise of the petroleum industry reflects very clearly the rapid industrial growth of the United States.

The petroleum industry prides itself on being a "typical American industry." Its accomplishments in the contributions made to the science and technology of petroleum exploration, production, and refining remain unequalled by any other oil-producing country. From its very beginning,


27 J. Howard Pew, Pres. Sun Oil Co., "Petroleum Industry", Investigation of Concentration of Economic Power (Part 14), Hearings before Temporary National Economic Committee, U. S. Senate, 76th Congress (Washington: Government Printing Office, 1940), p. 7196. (Note: a number of references to this work are made throughout the study and henceforth will be referred to as TNEC.)
the rise of the industry has been concurrent with the changes in the capitalistic system, from individual private enterprise to industrial corporations, to the rise of finance capitalism. 28

The tremendous and rapid technological growth of the petroleum industry has social significance in the fact that it has been nurtured and brought to maturity during a period of far-reaching cultural changes in the life of American society. The following brief socio-historical analysis will make more clear the significance of the social conditions, characterized by rapid industrial expansion, "rugged individualism", ruthless monopolistic competitive practices, and dynamic social changes during the formative years of the new industry, as they have exerted their influence upon the early and later petroleum industry.

Like any new industry, the petroleum industry required capital investments, an adequate supply of raw material, and an available labor force; the market demand for the products of petroleum may be assumed from the preceding discussion. When the Drake well "came in", crude oil sold for twenty dollars a barrel and quickly earned for itself the appellation, "Black Gold." Thousands of persons

rushed to the oil regions of Oil Creek and surrounding areas in Pennsylvania to stake their claims and to share in the riches of the flowing Goleonda.

In 1858, the founders of the Pennsylvania Rock Oil Company had all but abandoned their plans for drilling the Drake well because of the difficulty in financing their project. Two years later, money was everywhere in evidence. Business men, speculative promoters, and individuals from all walks of life vied with each other for the opportunity to invest their savings in all kinds of oil promotion schemes. Hundreds of thousands of dollars were literally sunk into oil-drilling enterprises. Each day new companies were organized with capitalizations ranging from $50,000 to $5,000,000 and all classes of people, from bootblacks to millionaires, became investors.29 The "Philadelphia Press", in March 1865, reported 71 companies with capital assets of more than $33,000,000 were organized within a two-week period. The Secretary of State in Albany, New York, reported the aggregate capital invested in the new oil industry amounted to about $350,000,000.30

29 "Our laboring classes, or the better sort thereof, are no longer content with the moderate interest to be obtained upon their deposits in the savings institutions; but visions of a dividend of two, three to ten per cent a month, tempt them to place their little all in the hands of the officers of the various popular oil companies." Morris, op. cit., p. 270.
30 Ibid., p. 258.
"It is astonishing to see how many persons will come up boldly and invest hundreds and thousands of dollars in oil-stocks, without any positive knowledge of the value of the property in which they invest; parties, too, careful in everything else, and who could not be induced to take a house and lot here at home until the title had passed the most critical legal inspection. There is a gambling recklessness in this whole business in oil-shares, that is truly wonderful to witness."  

With regard to its supply of raw material, the problem of the early petroleum industry was not with its scarcity, but rather with the over-supply of crude oil. With the successful completion of the first oil well in 1859, a hysterical frenzy swept the country. Drilling operations immediately were started almost anywhere, but especially near sites where there was any knowledge of previous oil seepages. Oil was produced at a rate far greater than even the critical market demand could absorb. Over-production, and the inability to find sufficient market outlets resulted in the loss of great quantities of crude oil because of inadequate storage facilities. There were not enough barrels to handle the constantly increasing output. Reservoirs were hastily dug into the earth and lined with cement, logs, or planks, but still thousands of barrels of oil were lost through fire and evaporation.

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31 Ibid., pp. 260, 264.

32 "The newspapers of the time (1861-1890) are full of accounts of oil running on the ground for the lack of storage facilities; and frequently, while oil from some wells was running down the ravines and creeks, drillers were boring other wells to swell the unused production." Ise, op. cit., p. 25. Cf. Stocking, Oil Industry and the Competitive System, p. 9, and Morris, op. cit., p. 38.
Over-production was stimulated not only by the avarice of those who were in search of "quick and easy" fortunes, but also because of a court decision concerning the "rule of capture." Under this ruling, ownership of crude oil belongs to him who brings it to the surface, regardless of the fact that the oil pool may lie directly below the property of another person. Once an oil well is penetrated, the gas or water pressure is reduced and the oil tends to flow to the low-pressure area. Until the middle thirties of the twentieth century, when proration and well-spacing regulations began to be effective, the practice in a new oil field was to drill a well as quickly and as close as possible to that of a competitor in order to avoid the risk of having oil under one's property drained into the well of his neighbor. The "rule of capture" is unique to the petroleum industry and, undoubtedly, it has been of tremendous influence both upon society and the industry. Inflated land prices, royalties, the haste with which prospective oil lands are leased, the speed with which wells

33 "The law pertaining to oil deposits has been an absurd, almost idiotic, conception anyhow...In an interesting Pennsylvania case, one man used a gas pump to suck oil into his own well and increased the flow, but decreased the flow of a neighbor's well. The neighbor sued but the Court of Common Pleas of Pennsylvania held the first man was entirely within his rights." Ise, op. cit., p. 217.

34 Ball, op. cit., pp. 145-146.

are "spudded in", and the twenty-four hour work schedule
of drilling crews -- all characteristic of the excited
activity in a new oil field -- are, in part, traceable to
this rule.*

"...This rule (of capture) is imbedded in the
customs and traditions of the oil producer, is
reflected in the covenants between lessors
and lessees, and traces through the ramifications
of sub-divided royalty interests that
give hundreds of thousands of people in all
walks of life a legal interest in the manner
in which oil is produced. Since under the
rule of capture each operator is forced to
protect his property from drainage by others,
else he suffer not only the loss of oil cap-
tured from him but also forfeits the lease it-
self for neglecting the interest of the lessor,
a powerful incentive is created making for
rapid development. This force compounds itself
in the aggregate and renders oil production
like an automobile equipped with an accelerator
but no brakes.*36

In addition to everyone seemingly over-eager to in-
vest their money, and with an over-abundance of raw mater-
ial, the petroleum industry was not without an adequate
supply of labor. Capital investments were accompanied by
large in-migrations of people, many of whom stayed on to
make the oil industry their occupation.37 The nation's pop-
ulation, inflated by thousands of immigrants, had increased;

36 Ibid., p. 7439.

37 Russell Brown, general counsel, Independent Petroleum
Association of America, Independent Petroleum Company,
Hearings before Special Committee Investigation Petroleum
Resources, U. S. Senate, 79th Congress (Washington: Govern-
the whalers from the decadent sperm oil industry were available, and there were the migratory adventurers from the West and "gold coast" areas -- these provided an abundant and available labor force. Many others were enticed to the oil regions by legendary tales of fabulous fortunes made by workers, capitalizing on their "first hand" information, who had invested their wages in some successful oil-drilling venture.

It is interesting to speculate why the oil fields, located hundreds of miles inland, attracted the men of the whaling industry. Usually the traditional seaman is scornful of the landlubber. Perhaps the "pull" was the lure of possible riches since their own industry was disappearing rapidly; or perhaps they felt they were embarked on another adventure, although of a different kind, in the search for oil. As T. S. Scoville, relating his experiences in Oil City, Pennsylvania in 1861, wrote:

"Here I am more in the heart of the oily dominions than elsewhere. I find that New Bedford and Nantucket, heretofore oildom, has been unsuccessful for several years past, and is coming here with its millions of money and its hordes of vessel officers, to harpoon the old mother of all whales (the earth) and draw her blubber by the force of steam, which must eventually injure whaling oildom very much."39

38 "...The whalers of New Bedford and Newburyport have come agreeable to earn good wages, and sometimes to acquire large fortunes, than to risk their lives amid the storms and dangers of the treacherous deep." Morris, op. cit., p. 41.

39 Morris, op. cit., p. 41.
Under the prevailing social conditions of the United States at that time, it might be assumed that it was "natural" to expect the people to enrich themselves, if they could, by taking advantage of the "golden" opportunities provided by land speculations, gold and silver mining, and oil prospecting. Money implied power, and to secure a comfortable life of ease, under existing conditions of laissez-faire, the means employed were of secondary consideration. Poverty was not a social responsibility, but a reflection of individual weakness.40

But the disordered conditions during the early years of the petroleum industry that fostered the spirit of "rugged individualism", in a large measure, were also responsible for the rise of the monopoly trust. The "rugged individualist" was he who survived to make economic gain under competitive conditions of "every man for himself, the devil take the hindmost." Modified and adapted to the doctrine of laissez-faire, "rugged individualism" became the dominant characteristic of American industrial culture. This was especially so in the petroleum industry where individualism, as a measurement of success, found full expression in a new industry which lauded the exploits of those who were willing "to take a chance."

With ruthless competition and individual enterprise
the theme of American industry and business, the guiding
principle for exploiting crude oil resources, as was the
case in the lumber industry, was not whether any real
need existed, or that any uses would be found for all the
oil produced, or that over-production was a social waste;
but, as exemplified by the "rule of capture", exploitation
of the petroleum natural resource was an opportunity to
enhance personal gains by producing oil more quickly, and
in greater quantities than competitors could.

Much of the waste and inefficiency of the early
petroleum industry perhaps was excusable, and, culturally,
might be explained though not necessarily justified, as
the result of inexperienced oil men and their ignorance
concerning problems of oil production. Certainly there
was a dearth of reliable information about the nature and
origin of crude oil, and about the methods of locating
and reaching underground reservoirs. The general public,
and many oil producers as well, had the false notion that
the supply of crude oil was inexhaustible because they be-
lieved it was being formed constantly in unlimited quanti-
ties within the earth. "The fact that wells would give out
at last was unknown until it had been proved by abundant
and most painful evidence."  

41 Stanley F. Horn, This Fascinating Lumber Business
42 Morris, op. cit., p. 234.
However, when the early experiences of the Pennsylvania fields were repeated in other oil fields far into the twentieth century,\textsuperscript{43} it becomes more difficult to rationalize such practices as "inevitable" economic costs due to inexperience and rapid growth,\textsuperscript{44} or to "justify" such conditions because of subsequent gains.\textsuperscript{45} Rather, the explanation may lie in the cultural experiences that measure the success, prestige, and power of the individual by the yardstick of wealth. It borders close to presumptuous rationalization to imply such conditions, under the circumstances then existent, were "naturally" to be expected. Whether a natural resource is wasted may be

\textsuperscript{43} Gerald Forbes, \textit{op. cit.}, (Ch. III), pp. 50-86.

\textsuperscript{44} "Much has been said in the past in criticism of the extravagant and wasteful manner in which America has developed and exploited her mineral resources. It was inevitable, I think, that it should be so. And yet, was it really waste? The very profusion and seeming limitlessness of our resources made for extravagant development and consumption. Why should we conserve, when products were a drug on the market and the available supply apparently without limit? There was apparently neither reason nor necessity. Nor must we forget that the very speed with which we grew was made possible only by ignoring waste and making prodigal use of what we had at hand." Mark Requa, \textit{Proceedings of Annual Meeting} (New York: American Petroleum Institute, 1920), p. 56.

\textsuperscript{45} "While using up of natural resources is deplorable, still the material gains resulting from their exploitation should not be overlooked, for in a large measure the gradual exhaustion of American petroleum has been offset by the advances of American industries this made possible." \textit{Oil and Gas Journal} XVIII (February 10, 1922), 91.
considered from two points of view: the economic or short-run costs involved, expressed particularly in terms of profit making, and the social or long range costs, measured in terms of the effect exploitation of natural resources has upon the general welfare of society. This interesting question of economic costs versus social costs, which cannot be argued here, is important to keep in mind, however, for it often has been involved in some of the policies and practices of the petroleum industry.

The classic example of this problem in the petroleum industry, of course, was the rise and fall of the Standard Oil Trust. Perhaps no other single factor has received such wide-spread attention and publicity, nor has so influenced the social organization of the petroleum industry as the policies and practices of the original Standard Oil Company during the forty years of its existence. The purpose

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47 Independent oil men have complained that State and Federal conservation measures are one of the principal causes of the growing concentration of power in the hands of the large, integrated companies, and that proration leads to price-fixing and maintains a high price for crude oil rather than prevents waste. See testimony of: Louis J. Walsh, V. Pres., Eastern States Petroleum Company, TNEC, pp. 7577-7580; K. A. Crowley, attorney, TNEC, pp. 7627-7629; Paul E. Hadlick, Secretary, National Oil Marketers Association, TNEC, pp. 8864-8865.
here is not to re-tell the turbulent history of the Standard Oil Company, nor to make any value judgment regarding the business ethics it employed to achieve and to maintain its virtually monopolistic position in the petroleum industry; that historic story has been vividly told by able writers from both the antagonistic and the sympathetic points of view. Yet, it is clear today, any study of the social history and organization of the petroleum industry would be incomplete without some consideration of the role played by the Standard Oil Company.

Its history extends from 1870 when the company was organized with capital assets of $1,000,000 until 1911, when, as the Standard Oil Trust with assets of $110,000,000, it was dissolved into thirty-three companies by the United States Supreme Court. This period in the history of the

48 "In short, the practices of the Standard Oil Company were common to almost all business of the time. The records of the American Sugar Refining Company, the United Shoe Machinery Company, the National Cash Register Company, the anthracite monopoly, some of the lumbermen's associations, and of a great many other industrial concerns are not much better than that of the Standard Oil Company." Ise, op. cit., p. 237.


50 Stocking, The Oil Industry and the Competitive System, p. 39.
Plate IV

A Partial View of the Esso-Standard Refinery
Baton Rouge, Louisiana

Photo by Roberts
petroleum industry represents the transitional or "adolescent" stage of its growth. The Standard Oil Company forms the bridge over which the industry crossed from the infant stage of spontaneous and random activities of its early hectic years to the efficiently organized and integrated activities of its mature stage of development today.

During the first decade (1859-1869), the petroleum industry was principally composed of many small enterprises engaged in one of the several businesses associated with the producing, transporting, and refining of crude oil. Today, the modern petroleum industry, although it still is comprised of thousands of companies, both large and small, is characteristically an industry dominated by relatively few multi-million dollar giant corporations that are fully integrated.51 And, regardless of the controversial issue of whether or not the means to attain its position of industry were reprehensible, or whether or not its business methods may be justified as a "necessary evil" because of the existing conditions,52 one indisputable fact is certain:

51 Infra, "Vertical Integration and Concentration of Control", Ch. 5.

52 "Rebates and drawbacks did not constitute the whole story. Other industrial concerns tried these, but failed to maintain by their use a permanent grip upon the profit-making capacity of that particular industry. Persistent search for the smallest economy in the manufacturing process, continued improvement of the product, use of a highly efficient intelligence service, boldness in planning expansions of plants, a vision of world-wide markets, high reward to those who in lesser capacities showed ability and vigor -- these things characterized the Standard group policies." Shuman, op. cit., p. 8.
the Standard Oil Company, and the subsequent "Trust", through its integrated organization, its methods of mass production and standardization of its products, has now become an integral part in the framework of the modern petroleum industry. That its influence still permeates the entire industry will become more clear in the following section of this study.53

There is little doubt but that the opportune arrival of the Standard Oil Company in the petroleum industry came when the social setting with respect to the industrial development of the United States in general, and of the petroleum industry in particular, was quite favorable. The rise of the Standard Oil Company, in no small measure, was attributable to the societal changes in America initiated by the advent of industrial capitalism, and to the chaotic conditions rampant within the petroleum industry.

Following the Civil War, leading industrialists had tried to achieve industrial monopoly by eliminating competition through secret or formal agreement with their competitors, or by absorbing their competitors under a common ownership or control.54 Standard Oil was not the first


company to seek monopolistic control of an industry, nor perhaps even the first to achieve such control.

"This movement toward concentration in large units is one which already has gone far in most industries which are concerned with the exploitation of natural resources, as it has indeed in industries of many kinds. It was long ago known that the forest lands were drifting into large holdings, and the same is true, to a lesser extent, of coal lands and of various kinds of mineral land."^55

What the Standard Oil Company did accomplish was to be the first "trust" to attain a successful industry monopoly that persisted for longer than just a short-lived period.56

Whatever may have been the reasons -- whether because of the inexperience of the first oil men, the lack of knowledge concerning the problems of oil production and refining, the speculative nature of the oil business itself, the prevalent competitive practices of the industry, or a combination of some or of all of these factors -- the petroleum industry, prior to the arrival of John D. Rockefeller and his Standard Oil Company, was unorganized and confused; it was characterized by numerous small, inefficiently managed

^55 Ise, op. cit., p. 265.
and operated business enterprises. The lack of coordination between the several branches of the industry -- production, refining and transportation -- so accentuated the tremendous waste of capital, labor and oil, that it provided a fertile field for the organizational genius of a Rockefeller.

"His discerning grey eyes saw three things: That the business needed a more stable price structure, that it needed a uniform standard for its products, and that things could be controlled through the control of refining and transportation, leaving the producers with the hazards of exploitation and discoveries. Because its products were to be made to uniform standards, he called his company the Standard Oil Company. Some of his methods seem ruthless and unfair when judged by the business standards of today; whether they violated the business ethics of his time is a question we need not try to answer. It does not affect the one important fact that stands out so clearly: more than any other man, John D. Rockefeller transformed a gambling game into an orderly business."57

It was out of such chaotic conditions that monopoly easily developed. Prior to 1870, John D. Rockefeller, while still in the produce commission business in Cleveland, already had invested in a local refinery with Samuel Andrews.

57 Ball, op. cit., p. 336 f.
Formed from this partnership in 1870 with capital assets of $1,000,000, the Standard Oil Company, three years later, had capital assets of $3,500,000 and was producing about ten per cent of the entire output of the United States refineries. 58

As has been previously mentioned, with hundreds of inexperienced men drilling oil wells without regard for market conditions or the lack of storage and transportation facilities, the production business was a hazardous and uncertain one. But the refining business was little or no better organized. In 1859, there were no oil refineries. The only refineries were the seventy-eight producing coal-oil, and these were quickly converted to the refining of crude oil. But within a few years, hundreds of small skimming and topping plants 59 had been built in and near the oil field regions. Most of these refineries were built and operated by businessmen who had no knowledge of the refining business and often they were operating with only limited financial backing. 60 Large refineries, in the sense of modern day establishments, were not needed, for the only products wanted from the refining process were kerosene and lubricating oils or grease. Not only was the

58 Stocking, The Oil Industry and the Competitive System, (Chs. 3-6), pp. 22-114.

59 Skimming plants removed only the lighter fractions of crude oil; they were the simplest and cheapest type of refinery. The topping plant was used for refining heavy crude oils, and chiefly produced fuel oil. Cf. Isc, op. cit., p. 153f.

60 Ibid., p. 44.
refinery business over-built, but, as was the case in pre-petroleum days when unwanted crude oil was permitted to flow over the ground into nearby sumps, gasoline produced in the refining process was also discarded as a waste product. 61

That too many refineries were built is indicated by their high rate of mortality. In 1869, ten years after the first oil was drilled, there were 170 operating refineries in the United States; in the next ten years, the number of operating refineries had decreased to eighty-six, 62 a loss of fifty per cent. A large number of these probably were questionable ventures in the first place; others, located in the oil fields, had to cease operations when the oil fields were depleted.

So weak and inefficient were the operations of many small refineries, and so ruthless the business tactics of the Standard Oil Company, 63 that by 1879, less than ten


63 "The Standard has superior efficiency in running its own business; it has equal efficiency in destroying the business of its competitors. It keeps for itself the profits of the first and adds to them the monopoly profits secured by the second. Its profits are far above the highest possible standard of a reasonable commercial return, and have been steadily increasing. Finally, the history of the persistent use of the worst industrial methods, the exaction of exorbitant prices from the consumer, and the securing of excessive profits for the small group of men who over a long period of years have thus dominated the business." Bureau of Corporations, Report of Commissioner of Corporations on Petroleum Industry, Part II, (Washington: Government Printing Office, 1907), p. xiv.
years after its organization, the Standard Oil Company controlled ninety to ninety-five per cent of the refining business in the United States. In gaining control of the refining business, Standard Oil early recognized the importance of maintaining a continuous flow of crude oil to its refineries. In order to be assured of this flow, the company, through such devices as secret rebate agreements with the railroad companies, and by obtaining control of virtually all oil-field pipe-lines, occupied a monopolistic position in the transportation of crude oil as early as 1877.

With control secured over the refining and the transportation facilities of the industry, the Standard Oil Trust was organized in 1879 in Ohio. When it was declared illegal by Ohio in 1899, the Trust reorganized as a holding company under the laws of New Jersey, with a capital of $10,000,000 that was later increased to $110,000,000. Thus, before the close of the nineteenth century, the control of the industry by the Standard Trust was that of a virtual monopoly.

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64 Cf. Stocking, The Oil Industry and the Competitive System, p. 21.
66 Ise, op. cit., p. 47.
67 Ibid., p. 225.
"From 1899 to 1907 it (Standard Oil Company), with subsidiaries...transported over four-fifths of the oil from the Pennsylvania and Indiana fields, manufactured more than three-fourths of the crude oil refined in the United States, owned and operated more than one-half the tank cars used to distribute its products, marketed more than four-fifths of all illuminating oil sold in the United States, exported more than four-fifths of all illuminating oil sent from the United States, sold more than four-fifths of the naptha sold in the United States, and sold more than nine-tenths of all the lubricating oil sold to the railroa5 companies in the United States."68

Monopolistic control of the petroleum industry had been accomplished largely by the emphasis upon economic efficiency. Volume sales of refined petroleum products that could be sold at lower prices than those of competitors' products was achieved by shrewd management, efficient operations on a mass production schedule, and a stabilized price structure. "I ascribe the success of the Standard to its consistent policy to make the volume of its business large through the merits and cheapness of its products."69

68 Stocking, The Oil Industry and the Competitive System, p. 38f.

But even though Standard Oil was able to offer improved standardized products at lower prices, the means employed to attain these economic ends aroused such bitter resentment and so antagonized public opinion that, in 1911, the economic "trust" was dissolved as a socially undesirable institution.

During its forty-year existence, and despite its monopolistic position, the Standard Trust had avoided entering the risky production business, producing only about one-tenth of the crude oil production; hence it really never achieved the status of either a complete monopoly, or that of a fully-integrated corporation which is so characteristic of the modern large petroleum corporation.

70 "Some of the larger companies within the 'Trust', engaged in other branches of the industry through their subsidiaries. One company, the Standard Oil of New Jersey engaged in all branches; its subsidiaries included 11 companies engaged in refining, 5 lubricating companies, 3 crude oil companies, 14 pipe-line concerns, a tank-line company, 6 marketing entities and 16 natural gas companies. In addition some 7 pipe-line and refining companies were closely affiliated with the group." Harry W. Laidler, Concentration in American Industry (New York: Thomas Y. Crowell, 1931), p. 17.

71 One that handles petroleum from the well to the consumer, that is, it is engaged in all branches of the industry: producing, transporting, refining, and marketing. Infra, part III, Ch. 6.
However, the feature of its structural organization in integrating the transportation, refining and marketing branches into one business has set the pattern for the present-day organizations of the large oil corporations. For, although the Standard Trust was dissolved into thirty-three companies, the dissolution decree had little effect in destroying the influence of the former Trust. During the twenty-five year period, 1882-1906, the Trust is reported to have paid dividends of more than a half billion dollars ($548,436,446); but in a fourteen year period, 1911-1924, the various companies into which the Trust was dissolved paid out cash dividends of more than one billion dollars ($1,619,956,009).72

Old Standard Companies, formerly engaged in only one branch of the industry, were merged or consolidated almost immediately into several larger, fully-integrated units following the dissolution decree. Of the so-called twenty major, fully-integrated oil companies today, those with assets of more than $50,000,000, nine formerly were affiliated with the Standard Trust.73 These same companies, those of the old Trust, still have control of the largest refineries, pipe-lines, and markets, and the only hope of a competitor to succeed is "to become large enough to

72 See op. cit., p. 231.
73 See Appendix, Table 1.
integrate completely through ownership of pipe-lines, storage facilities, refineries, and market outlets.\textsuperscript{74}

By the turn of the twentieth century, in a period of less than fifty years, the petroleum industry -- beginning with an oil well drilled on a lease for which $5,000 was paid, $500 down and the balance on a note --\textsuperscript{75} had become an important industry with investments totalling hundreds of millions of dollars; it had grown from a confused and disorganized industry of numerous small businesses, steeped in the traditions of laissez-faire individualism and private enterprise, into an industry under the virtual monopolistic control of a single, multi-million dollar corporation trust. The fact that the Standard Trust never seriously engaged in the production branch has kept alive within the industry some of the traditions of rugged individualism and competitive private enterprise. It is rather interesting that the modern petroleum industry, dominated as it has been since the dissolution of the Standard Trust by a relatively few large oil corporations, still characterizes itself in terms of the "traditional oil man" and the small independent oil company.\textsuperscript{76} Even now, in 1948,

\begin{itemize}
\item \textsuperscript{74} Kemnitzer, \textit{op. cit.}, p. 13.
\item \textsuperscript{75} \textit{The Early Years}, p. 1.
\item \textsuperscript{76} J. Howard Pew, \textit{TNEC} (Part 14), p. 7164 ff.
\end{itemize}
it is engaged in a large-scale advertising campaign, financed by the major oil companies, to acquaint the public with the intense rivalry and competition that exists within the industry.\footnote{77}

These formative years of the petroleum industry were very impressionistic ones. Today, the industry still is relatively young, and the early experiences of the new industry, etched deeply into its history, have had a tremendous influence upon its social structure and organization. To the cultural heritage of the nineteenth century have been added the significant influences of modern technology upon the petroleum industry, indirectly through its effect upon the industrial society of the twentieth century, and directly as it has affected the industry itself. Some of the more important contributions modern technology has made to the cultural changes of the petroleum industry will be given consideration in the following chapter.

\footnote{77 "First Anniversary Finds Public Relations Progress Under Way on Many Fronts", \textit{Oil and Gas Journal}, XLVI (November 15, 1947), 206.}
CHAPTER 3

TECHNOLOGY AND PETROLEUM CULTURAL CHANGE

"What technology is or does depends upon the essential characteristics of the contemporary social order; the discovered and available kinds of raw materials, the recognized forms of physical energy, the technical heritage, the ownership of these things; the character of the available labor force; the nature of the 'economy' whether capitalist, collective or otherwise; the composition and objectives of the ruling class; current standards of living, and the classes that correspond with them; the prevailing habits of taste, ambition, and apprehension whether animistic, magical, or scientific; the situation in non-economic regions of culture -- religious, domestic, ceremonial, artistic, etc."¹

Technology, as a product of human achievement, refers to the application of scientific discoveries and mechanical inventions to the problem of producing economic goods which people, by their own efforts, are otherwise unable to achieve. In this sense, technology extends far back into the history of man. It marks the beginning of the "indirect" or "roundabout" method of production, the use of which often demarcates the civilized from the

primitive society. The importance of technology in a given society depends, of course, upon the cultural development of that society, and any evaluation of its influence would have to take into account many elements of the culture complex. The technological character of the twentieth century industrial society represents, in a large measure, the cultural accumulation of many centuries.

The cultural development of "pre-petroleum" American society, together with the fusion of competitive individual enterprise into the corporate structure of industrial capitalism in the latter half of the nineteenth century, were important social phenomena that directly influenced the petroleum industry during its formative years. More direct in its influence and effect upon the petroleum industry than the culture of "pre-petroleum" society, although less dramatic and colorful than the conditions attending the establishment of the new industry, the technology of the twentieth century has been none-the-less important in the cultural changes it has brought to the industry.

At the turn of the twentieth century, the petroleum industry was under the dominance of the Standard Oil Trust; kerosene was the principal product of the industry; there were very few professional geologists or engineers, and

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there were no elaborate research facilities. The automobile was still in its experimental stage; there were no airplanes, nor Diesel engines.

But, within the first two decades of the twentieth century, startling and epic events -- social and technological -- wrought radical changes in the American society that have almost completely altered the complex of petroleum industry culture. The automobile, the telephone, the airplane and the radio appeared; because of its questionable business ethics, the Standard Trust was dissolved in 1911; and the nation emerged victorious from the First World War. The technological developments of the automotive and other American industries, and the prosecution of the World War provided ample and increasing markets for petroleum products. New oil companies and former "independent" rivals of the Standard Trust gave stern competition to the established oil companies formerly with the old "trust".

Important as these factors have been to the phenomenal growth of the petroleum industry during the past twenty or thirty years, perhaps none has contributed more to the rapidity of its growth nor influenced greater changes than has modern technology.

Technological progress has moved so quickly within the petroleum industry that many improvements are out-of-date almost before they are used. The recently developed
process of catalytic cracking, for example, cost the refining branch of the industry in the neighborhood of $200,000,000 to re-tool its refineries. Along with its vast expenditures for technological improvements, the modern petroleum industry also spends more than fifteen million dollars annually for research and experimental laboratory work; it now employs about fifteen per cent of the industrial research workers in the United States.

Throughout all branches of the industry, science and technology have all but revolutionized the activities of the petroleum industry.

Exploration

Prospecting for oil was, and still is, a very uncertain business. At first, aside from "hunches", "oil smellers", and "doodle-bugs", the only guide for locating

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5 "The divining rod was a forked stick, commonly of either hazel or peach, held by the extremity of each prong of the fork in a peculiar way -- the palms of the hands being upward, and the prongs crossing the palms, and held by the thumbs and tips of the fingers. The wizard walked over the country he was to try, and as he approached the greatest body of oil in the immediate neighborhood, the thick handle of the fork was supposed to turn down, in spite of all the efforts of the holder to prevent it. There is no doubt that, owing to the way in which it was held, it had a mechanical tendency to turn, and this increased the will of the holder, and in such a way as to remain undiscovered by even a close observer. Wells were often discovered by such means, and these "diviners" were sometimes able to realize handsomely on their efforts." Ise, United States Oil Policy, p. 32.
oil deposits was to drill in or near areas that were formerly known to have had surface oil-seepages.

"With regard to the most favorable positions and conditions for sinking a well, there is still (wide) difference of opinion... In fact, there appears to be about as reliable a rule for selecting the location of a paying well as there is in deciding which is the fortunate number in a lottery... More than one well have been put down in obedience to dreams; the dreamer sometimes making a lucky hit, and at other times securing a blank of a dry well... Then there are oil smellers, who profess to be able to discover the proper place for a well by smelling the earth."6

While geology still is not an exact science, in that it cannot tell where oil will be found but can merely say where the chance of finding oil is greater, it has succeeded in reducing the risk of hazardous guessing. The odds against successful prospecting have been reduced to about six or seven to one, as compared with an estimated historical average of forty to one.7

Geologic crews use the plane table, introduced around 1900, as a method for improving the contour mapping of the geological structure of the earth's surface; today, aerial photography has been introduced and is being used extensively for the same purposes. Geophysical crews probe the subsurface structures with an amazing degree of accuracy by

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7 Everette E. DeGolyer, an independent producer, TNEC, (Part 14), p. 7391.
measuring the pull of gravity, magnetic attraction, the speed of sound waves, the behavior of electrical currents, and, more recently since 1943, the radio-activity of gamma and neutron rays.

The torsion balance, an instrument for determining variations of gravitational pull, was developed in 1922; the following year the gravity meter was developed and, by 1943, it had been so developed as to replace, almost entirely, the use of the torsion balance. Around 1923-1925, the magnetometer and seismograph were developed which make it possible to map deep sub-surface structures with great precision. Electric well-logging, core drilling, and improved techniques for analyzing drill cuttings have extended the knowledge of the geologist about sub-surface conditions in a prospective oil area. The position and thickness of oil-bearing sands are determined with great precision by means of electrical and radio-active logs; cores for detailed examination are taken from important sands or other formations; the well is drill-stem tested; casing is set and cemented through the sands to be tested; the well is re-opened after the sand test by the so-called "shot-gun perforation", firing several steel projectiles simultaneously through the casing into the oil sands.\(^8\)

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\(^8\) DeGolyer, **TNEC** (Part 14), p. 7670.
A seismograph crew sets off dynamite charge which creates small "earthquake".

Sound waves set up in the surrounding earth travel at various speeds depending upon the kinds of underground structures through which they pass.

A seismograph in the truck measures the variations of the sound waves and records the speed at which they travel.
In addition to the geologic studies of sub-surface structures by "core analysis" of sand or other formations brought to the surface from the various strata through which the well is being drilled, the mineralogist, through the study of the mineral content of sediments, and the paleontologist, through the microscopic examination of subterranean fossils, are recent additions to the staff of technical experts in the exploration division of the industry. The recent stimulus of the second World War upon the research in the field of electronics and radar have encouraged the petroleum geologist to investigate, develop, and adapt these techniques to oil prospecting; the gamma ray and the neutron ray already are widely used.9

These represent but a few of the recent technological improvements now used by the petroleum geologist, most of which were unknown prior to 1920.10

**Production**

The accumulation of improved methods of determining the presence of oil, however, neither brings the oil to the surface, nor does it give absolute assurance that oil will be found. In spite of all the improved techniques of exploration, the presence of oil is found only by

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10 DeGolyer, TMEC (Part 14), p. 7396.
From a rock or "core" sample taken from the drilling hole, the paleontologist identifies the fossils of former animal and plant life. These fossils enable him to determine the age and porosity of subterranean structures that provide important clues as to the probable location of oil-bearing sands.
drilling. The drilling of the oil well, and, if the drilling operation is successful in reaching an oil pool, the regulation of its flow constitute the production activities of the petroleum industry.

Drilling

The drilling of the first oil well in the United States was in 1859, but the method used to drill this well was adapted from that devised and used fifty years earlier (1806) by the Ruffner brothers in their salt-well operations. The cable-tool method of drilling, as developed by the Ruffners, was based upon ancient techniques employed by the Chinese more than 2,000 years ago, and was widely used in oil-well drilling operations until about 1901. After the discovery of oil along the Gulf Coast areas of Texas and Louisiana, the cable-tool system of drilling was inefficient for reaching the depths at which considerable oil was discovered. The rotary drill was then introduced and it has been

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11 Of 27,717 wells drilled in 1939, 6,474 or 23 per cent were "dry wells". Cf. Facts and Figures, 7th Edition (New York: American Petroleum Institute, 1941), p. 80.


13 The rotary drill cuts a hole by a rotating bit on the end of a hollow drill stem. Mud is pumped through the drill stem into the well, and is kept more or less in circulation -- being forced by powerful pumps through the drill stem to the bottom of the well where it picks up cuttings resulting from the drilling operation, and carries them to the surface. The hole is constantly filled with mud until the well is actually finished and cleaned. Cf., DeGolyer, TMIC (Part 1), p. 7670.
In the lower photograph floormen are adding another section of drill pipe. To the end of the hollow drill stem is a bit which, through the movement of the rotary turntable, bores a hole deep into the earth. As the hole is deepened it is lined, at intervals, with large steel pipe called casing, each "string" fitting inside the previous one, something like a telescope.
so improved that its advantages of speed, its ability to drill through soft and caving rocks, the economy of casing required, and, consequently its ability to drill to great depths have made it the most widely used method of drilling in the major oil fields. During the last ten to fifteen years, it has superseded the cable-tool drill, both for drilling and exploratory purposes.

Twenty-five years ago, the deepest oil well was about 7,000 feet. Today, a well of 5,000 feet is considered relatively shallow, and many oil fields have wells producing below the level of 10,000 feet. The deepest well drilled to date (1945) is below 16,000 feet, with the deepest producing well down below 13,000 feet.14

Substantial improvements also have been made in the design of drilling equipment, and in the material used for drills and casing. Scientific research has further encouraged the use of the rotary drill through its discoveries of chemically treated drilling muds, improved methods of oil-well cementing, and acid treatments of certain formations such as limestone -- all of which are preventives against cave-in and cratering, and materially speed up the drilling process.15

Conservation and Proration

Throughout the history of the petroleum industry, one

14 John M. Lovejoy, "Production Technology" in Our Oil Resources, p. 84.
15 Ibid., p. 86.
of its major problems has been over-production of crude oil; another, has been the inability to state, with any degree of accuracy, the actual volume of crude petroleum deposits "under the ground in any given tract of land, and nothing but the drill and actual test will determine that."\textsuperscript{16}

Since the earliest days of the industry, attempts have been made to curtail the output of crude oil during periods of over-production. The first of such efforts was made during the "flush" production years, 1874-1878, but these conservation laws were actually little more than attempts to achieve voluntary regulation of oil production in an effort to reduce the waste of gas and oil and they were seldom very successful.\textsuperscript{17}

The uncertain productivity of newly discovered oil fields, and the practice of completing wells as rapidly as possible and permitting them to flow "wide-open" so long as they produced a commercial quantity of crude oil has, in the past, led to alternating periods of large and small volumes of crude production. For example, in 1924, it appeared the country would suffer from an acute shortage, but by 1927, the industry was again concerned with an oversupply of available crude petroleum.\textsuperscript{18} In view of this

\textsuperscript{16} K. A. Crowley, \textit{TNEC} (Part 14), p. 7381.
\textsuperscript{17} \textit{Ise, United States Oil Policy}, pp. 129-137.
\textsuperscript{18} Pogue, \textit{TNEC} (Part 14), p. 7442 \textit{ff}. 
situation of fluctuating supplies of crude oil and because
the industrialized society was rapidly becoming more and
more dependent upon the products of petroleum, serious con-
sideration was given to conservation measures around 1930,
for it was evident that some control of production was
needed in order to maintain a balanced supply of crude oil.
The strong traditions of laissez-faire individualism, es-
pecially in the production branch, made it difficult to
obtain effective legislation; however, in 1935, Congress
authorized the Interstate Oil Compact, a program that per-
mits "a group of sovereign States cooperating on a voluntary
basis, to help each other solve their individual problems
relating to the conservation of an irreplaceable natural
resource. Originally, it was ratified by six States but
the membership has increased until today (1946) 17 oil-pro-
ducing States representing approximately 90 per cent of
the natural gas and 80 per cent of the oil production of
the Nation are members."\(^{19}\) The inherent distaste for gov-
ernment regulation of any kind became evident by such prac-
tices as running "hot oil",\(^ {20}\) and price-fixing schemes. In

\(^{19}\) O. C. Bailey, an independent oil producer, *Independent Petroleum Company*, p. 76.

\(^{20}\) "Hot Oil", after the advent of proration, refers
to any oil taken illegally from wells. Some operators used
various devices to circumvent the regulations; for example,
concealed pipelines, piping the oil around gauges, and cut-
ofs. In addition to these mechanical techniques, some of
the excess production was shipped across State lines. Cf.
Samuel B. Pettingill, *Hot Oil, The Problem of Petroleum* (New
York: Economic Forum, 1936); this book is based upon testimony
taken before the Cole Committee of the House of Representa-
tives in 1935.
1936 there were 222 criminal prosecutions by the Department of Justice because of violations of the so-called Connally "Hot Oil" Act of 1935. This Act prohibited the inter-state shipment of illegally produced oil, and for violations of this Act, several officials of the major oil companies were convicted in the now famous Madison Case. Although the industry has gradually and reluctantly accepted proration (the rationing of the amount of oil production according to the capacity of a well to produce), there is no general agreement that proration has served its purpose of conserving crude oil supplies. There have been many complaints that it is being used, as were earlier attempts to regulate crude oil production, to discriminate against the independent producer and to fix the price of crude oil rather than to prevent wasteful methods of production. The major companies have seemed to favor the proration system while the non-integrated or independent oil producer has opposed it, not because the latter opposes conservation, but because he claims the economic results have been unfavorable to his position.

21 At Madison, Wisconsin, the Justice Department prosecuted several officials of the major oil companies for price-fixing, and several convictions were returned. See Gerald Forbes, *op. cit.*, p. 92.

22 *Ise, United States Oil Policy*, pp. 21-22.

Irrespective of these intra-industry arguments which
again seem to emphasize the economic rather than the social
costs, conservation measures have checked the excessive
drilling of wells that was common under the "rule of cap­
ture", and the flowing life of an oil well has been pro­
longed.24 "Well-spacing"25 has been introduced, drilling
costs have been reduced, and certain measures have been un­
dertaken to improve secondary recovery.26 However, since
secondary operations (reviving old wells by re-pressuring
with gas- or water-flooding) are more expensive than pri­
mary operations (the use of native reservoir energy to
bring oil to surface), they have not been widely used. It
is estimated that while the total production of crude oil
in the United States has totalled 28,000,000,000 barrels,
there have remained in the sand, after depletion of primary
reserve, an estimated 100,000,000,000 barrels of crude oil
of which at least one-third could be recovered by presently


25 Well spacing is a system of limiting the number of
wells that may be drilled; the number varies according to
the estimated amount of oil that lies below a given tract.
The system has been severely attacked as being based on a
false hypothesis, namely, that the amount of oil underlying
a tract is proportionate to its surface area. See Crowley,*

26 C. C. Anderson, Petroleum Engineer of Bureau of
308-314.
known methods of secondary recovery.²⁷ Here, once more, is evidenced the cultural lag between the considerations given to long run social benefits of recovering known oil deposits, and the short run economic considerations to relative costs of exploiting new oil pools as compared with re-working old wells and fully exploiting presently producing wells.

Transportation

One of the unique features of the petroleum industry is that most of its products, except for by-products such as greases, waxes, and asphalts, are liquid; hence they can be carried by railroad, ship, pipe-line, or truck. Modern means of transportation have developed quite considerably since the early days of the industry along Oil Creek in Pennsylvania. Under conditions of flush production, the drilling of more and more wells seemed most important, and problems of transportation and storage were given little thought until the situation became serious. With drilling operations concentrated along Oil Creek, it was possible for the oil to be barrelled and shipped via rafts or barges along Oil Creek down to the Allegheny River.²⁸ These modes of water transportation were crude affairs about fifty feet


²⁸ The Early Years, p. 3.
long and fifteen feet wide. Being hastily constructed, they were neither very sturdy nor elaborate. More serious difficulties of transportation arose, however, when the search for oil began to move inland and the industry migrated to areas where there were no highways or railroads to the new oil fields, and water transportation was not easily accessible. Long, heavy wagons, drawn by as many as sixteen to eighteen horses were often employed to move the oil to the waterways. Some idea of these primitive conditions may be gleaned from accounts of the transportation and storage problems written during the early period of the industry.

"In and out among clanking boring tools, wheezy engines, roaring, flowing wells, and creaking pumps, go the endless processions of wagons of oil-barrels up the valley, and wagons of barrelled oil down the valley. There is no regular highway, but each waggoner seeks out a road of his own, wherever he can thread his way through the maze of derricks, and wherever he can get his wheels to turn around. The soil of the valley is cut and churned into mud so deep that it is a wonder how the horses can pull at all. Into the valley, through its gorge-like mouth, files a long procession of wagons, each drawn by two horses, and containing five empty barrels, to be filled with oil. The entrance gained, each waggoner seeks out his own road, and pushes through at as rapid a pace as possible, to prevent getting stuck in the mud. Forward they go, the drivers cracking their whips, shouting, cursing, and staggering about through the mud, the horses straining every nerve and keeping their feet in a marvellous manner over unequal ground; the wagons now tilted sideways by a huge rock sunk in the sea of mud, now plunged over the hub in a deep pit, and now clattering along the rocky bed of the stream. One wagon is wrecked by striking a rock, and another is immovably
Plate VIII Laying a 12-inch Pipeline

Before it is buried, the pipe is given a protective covering by a "doping" machine.
fixed in a deep quagmire. Then the confusion grows ten times worse from irate drivers, who see time and money slipping by them so rapidly; for, at two dollars a barrel for hauling oil three miles, time is money."29

Today, the petroleum industry has correlated the various modes of transportation into an efficient branch of the industry. In the very early days of the Standard Oil Company, John D. Rockefeller recognized the importance of transportation facilities in order to insure his refineries of an adequate and continuous supply of raw material. One of the significant things about the transportation system of the petroleum industry is that it did not await the development of the regular carriers to devise means of transporting the crude oil from the fields to the refineries. It built and developed its own carriers. It built the first tanks which replaced the barrel on the wagon and the river scows; it developed and built its own steel railroad tank cars; it developed the modern tank truck and the modern all-steel oil-tanker ship.30

Perhaps the most important development in the field of petroleum transportation was the development of the oil pipe-line, through which "one-ninth of all the freight tonnage in the United States flows underground through the greatest network of oil lines in the world."31

29 Morris, op. cit., pp. 140-141.
Plate IX  Modes of Transportation

Ocean-going tankers

River Barges

Overland tank-trailer trucks

Railroad tank-cars
In 1865, the first crude-oil pipe-line was five miles long and was capable of moving eight hundred barrels of oil daily.\textsuperscript{32} It was primarily built to transport the crude oil from oil fields to refineries, and, until about 1930, this was the only use made of the pipe-line. Today, in addition to the vast quantities of crude oil transported by the pipe-lines, "clear streams of gasoline and kerosene and darker streams of fuel oil flow a little more briskly from the refineries to the marketing areas."\textsuperscript{33} Pipe-lines carrying petroleum products -- "product lines" -- total about 15,000 miles, while the crude-oil pipe-line mileage has increased to 125,000 miles.

The movement of refined products by pipe-line has become an important function of the petroleum transportation system. "Many different kinds of petroleum products can be moved in tandem through a vast pipe-line network without any buffer or other mechanical device to separate them. The secret lies in scheduling the flow so that products are pumped into the line in a sequence determined by relative gravity and viscosity. For example, premium gasoline adjoins housebrand gasoline, its closest neighbor in gravity and viscosity. Diesel fuel travels next to

\textsuperscript{32} Dow, TNEC (Part 15), p. 8584. See also, Paul H. Giddens, \textit{Beginnings of the Oil Industry} (New York: Macmillan Company, 1938).

\textsuperscript{33} \textit{Pipe-lines"}, p. 5.

\textsuperscript{34} \textit{Loc. cit.}
kerosene which is similar in those characteristics. In this way, contact between dissimilar products is avoided. While the transportation of refined products is relatively new, it is rapidly being expanded and its expansion "is one of the outstanding trends of the modern pipe-line industry."

The tank ship, despite the increased pipe-line mileage and the use of the tank truck, has been vastly improved and it still continues to be the prime mover of petroleum products. In 1900, the American oil companies owned three tankers with a dead-weight capacity of 10,350 tons; in 1946, they owned 964 tankers with a dead-weight capacity of 14,018,203 tons. The speed of the vessels has nearly been doubled; their hulls have been enlarged; their engines re-designed, and the cost of transportation by tank ship has been decreased over seventy per cent.

Transportation by truck also is increasing. Fleets of large tank truck and tank trailers have been built, and, while there are no accurate or complete figures as to the number now in operation, conservative estimates indicate

35 Ibid., p. 34.
36 Ibid., p. 9.
37 Ibid., p. 64.
38 Pew, TMRC (Part 14), p. 7247.
there are approximately 125,000 tank trucks now in operation. There is a definite trend toward the greater use of the truck, especially for relatively short-distance hauls. It is now commonplace for deliveries of gasoline over a radius of 300 to 350 miles to be made by truck from the refinery, and, in many cases, they have displaced the tank car in movements from the refineries to the bulk plants. 39 "In fact transportation by truck at the present time (1939) is undergoing more rapid development than that by any other vehicle." 40

Refining

Perhaps nowhere has the influence of technology been more evident than in the petroleum refining branch of the industry. Between 1860 and the present time, a great many changes have been instituted through the technical improvements in the design of the refining plant, and the refining processes. During the past twenty-five years particularly, the industry has devoted considerable money and time to scientific research and development which has contributed tremendously to improving the efficiency and flexibility of modern refineries, and to the production of better products at lower costs. Present day gasoline and

40 Dow, TNEC (Part 15), p. 8590.
motor fuel oils are outstanding examples of technical achievements.

A radical change in the composition of petroleum products has resulted from the successive improvements in the technical processes employed in the modern refinery. In the very early years of the industry, kerosene was such a profitable commodity that refiners were not much concerned about by-products; kerosene, liquid lubricating oils, and semi-lubricants or grease were the chief products of the early refineries. The first refining processes were largely a matter of the skill and experience of the superintendent who obtained various grades of lubricants by mixing oil and grease in different proportions. The quality of the product rested with the "secret formula" of the superintendent, and it was always a concern of the refinery owner whether his superintendent would be offered a more lucrative remuneration by one of his competitors, or that his superintendent might surreptitiously sell his secret to a competitor.

"These refineries are very numerous in a small way, consisting of merely a stone-hut connected with an adjacent board-shanty by a trough, the whole surrounded by a few oil barrels. The whole establishment is constructed of brick and

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41 Wilson, TEFC (Part 15), p. 8619.
42 Shuman, op. cit., p. 4.
iron, and in every way rendered as nearly fire-proof as possible. The crude oil, as it is received from the wells, is stored in immense vats under ground, from which it is taken by rotary pumps and conveyed in pipes to different parts of the works. The first operation is distilling, in which oil is placed in receivers over a coal fire, and the vapor drawn off. That which comes off first is the light oil, and is called naptha. There is no dividing line between naptha and oil, but when the operator thinks it is heavy enough he shuts off the naptha and calls it oil.  

One of the most important achievements of the petroleum industry was the introduction of the cracking process around 1911-1913. It did not become commercially important until after 1920, but since that time it has undergone tremendous technical improvements. Prior to the discovery of the cracking process, the refining process was a rather simple distillation process known as "topping" or "skimming" which was used to separate the light oil products from the heavy crude. This skimming process was improved upon around 1899 when the "straight run" distillation operation successfully was employed to manufacture gasoline. Today, the widespread adoption of the cracking process has increased the yield of gasoline from ten per cent per barrel of crude oil in 1904 to forty-four per cent.

43 Morris, op. cit., pp. 88-90, passim.
With the development of the automobile and the increased demand for motor fuel, research has developed many technological improvements in the refining of crude petroleum; often these improvements have followed one another with such rapidity that many of them are outmoded before they are extensively used. Perhaps the most outstanding development has been the polymerization process, a process by which light hydrocarbons, under suitable temperatures, combine to form heavy hydrocarbons. The first such processes to go into general use were the catalytic, and were applicable only to refinery gases resulting from the cracking process. Later, the thermal-polymerization processes were improved so that natural gas can also be used. Both these processes make polymerized gasoline which has superior anti-knock properties, and is particularly suitable for airplanes and other high speed gasoline engines.

One other refining process should be mentioned because of the serious consideration it now is receiving, the hydrogenation process. This process involves the addition of hydrogen to hydrocarbon molecules, generally at

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47 *Loc. cit.*
high pressures and temperatures, in the presence of a catalyst or "reaction promoter". This process eliminates undesirable impurities, improves the quality of a wide variety of petroleum products, and converts very heavy oils into high-quality gasoline. Theoretically and commercially, it is possible to convert ninety-five per cent of a barrel of crude oil into gasoline by the hydrogenation process; however, the present demands for light oils, lubricating oils, etc., do not make the use of this process economically feasible from the viewpoint merely of producing gasoline.\(^{48}\)

During the past few years, petroleum chemists have been busy developing additive agents which accomplish a great variety of results, such as inhibiting gum formation in gasoline and improving its color stability. The most important additive agent developed has been the "ethyl fluid" which contains tetraethyl lead, and it is widely used today as a means of improving the anti-knock quality of gasoline.\(^{49}\)

Finally, the refining branch of the industry has so utilized a barrel of crude petroleum that its by-products are now numbered by the hundreds, running all the way from solvents, plastics, and explosives to perfumes, drugs, and

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\(^{48}\) Ibid., p. 8350.

\(^{49}\) Ibid., pp. 8625, 8643.
The improved techniques of petroleum refining are estimated to have reduced the costs of refining by as much as fifty per cent.\(^{51}\)

One of the characteristics of modern technology, and this is true of the petroleum industry, is that many of the technological innovations can be used only at a very great expense and can thus be utilized most profitably only under conditions of mass production and large-scale financing. Mass production, usually distinguishable by huge plants, high speed production, and a large volume output of a uniform or standardized product, is typical of the modern petroleum industry.\(^{52}\) The multimillion dollar oil corporation with vast amounts of money invested in capital goods of plants, machinery, and raw materials is a consequence of modern technology.

When an industry such as the petroleum industry becomes highly mechanized, specialization becomes paramount for efficient operation. The technology of mass production methods requires the maintenance of a continuous flow of goods and materials at all stages of production; otherwise, any delay or stoppage involves a loss of production activity.

\(^{50}\) Ibid., p. 8634.


\(^{52}\) Pogue, TAECl (Part 14), pp. 7437-7438.
and a resultant rise in the unit cost of production. In order to insure this continuity of operation and to maintain its high degree of productive efficiency, the petroleum industry has integrated the several branches of the industry into one corporate structure, while, at the same time, each branch carries on its particular specialized activities: production, transporting, refining, or marketing. The following section will consider more in detail the manner in which the dictates of technological mass production methods and certain peculiar characteristics of crude petroleum have influenced the economic structure through vertical integration and the concentration of control by the large oil corporation.

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PART III

THE ECONOMIC STRUCTURE OF THE PETROLEUM INDUSTRY
CHAPTER 4

INDUSTRY LOCATION AND VERTICAL INTEGRATION

To say the structure of the modern petroleum industry is complex is tantamount to an understatement. Chief among the factors contributing to its complexity are (1) the location of the producing and refining branches of the industry; (2) the integration of the several businesses into one industry group; (3) the degree to which control over the industry is exercised by a relatively few multi-million dollar corporations; and (4) the large number of small, "independent" oil companies in the industry.

Industry Location

To present a detailed analysis of the many factors and implications that are involved in a full discussion of industry location would require considerations far too numerous and complex to be included within the scope of this study. It is the manner in which industry location, as a social phenomenon, is related to the structure of the petroleum industry that is of interest to this study.

Industry location is sociologically significant principally because the location of the production branch is determined solely by natural phenomena, while the manufacturing or refining branch is determined as often by cultural as by natural factors. As a consequence of these factors and
because of the tremendously rapid growth of the petroleum industry since the close of the first World War, a distinctive feature of the industry is the wide geographical gap that exists between the production and the refining branches.

Since the expansion of the petroleum industry during the past quarter of a century has been too recent to have influenced industry location to any considerable degree, the more important factors are the nature of crude petroleum, and consumer markets. The former determines the location of the production branch, while the latter has received greater consideration with respect to the location of the refining branch.

Despite the many technological improvements in the fields of exploration and drilling, production branch location is dependent upon the peculiar characteristics of crude petroleum: "its exhaustibility, its concealment, and its fugacity, that is its fugitive character arising from its fluidity." ²

The only known method of accurately locating and reaching underground reservoirs of crude petroleum is to

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drill a well. "We have no tried and proved technique of actually and definitely locating an oil deposit of commercial importance in advance of the drill."\(^3\)

Unlike forests, for example, crude petroleum is an exhaustible and irreplaceable natural resource. Within the limits of present knowledge concerning the origin and nature of crude oil, there is general agreement that underground reservoirs of oil have accumulated over a period of countless years, and that no method has yet been discovered, nor is it likely a method will be found, to replace crude oil in its natural state, nor a way found to stimulate its natural rate of accumulation.

Oil also has been called a "fugitive" resource\(^4\) because it tends to "flee" from its original place if an oil pool is penetrated and the underground pressure is reduced at some point; it was this characteristic of fugacity that was largely responsible for the "law of capture" which has been discussed previously.\(^5\)

In contrast to sedentary mineral deposits of coal, gold, and other minerals, the tendency of fluid crude petroleum to migrate and to accumulate in anticlinal and stratigraphic traps makes it less stable with respect to its geographical location, but, once the supply of crude oil in a

\(^4\) Stocking, *Oil and the Competitive System*, p. 9.
\(^5\) *Supra*, Chapter 2.
Above: This map shows that oil has been, or may be, found in most of the States. All together, these oil regions cover one-and-a-half million square miles, or over one-half of the total land area of the United States.

Below: Three of the principal types of underground structures to which crude oil migrates and accumulates, or is "trapped".

Plate X  Oil in the United States
particular field is reached, it can be more easily exploited and is likely to be more quickly exhausted than coal deposits, for example. A striking difference between these two resources is that "a considerable amount of crude petroleum is brought to the surface by natural gas pressure over which man has only limited control, (whereas) not a pound of coal leaves its subterranean abode without man's will."

Various attempts by experts to estimate the future supply of crude oil in terms of proved reserves (the amount of crude oil that may be extracted by present known methods from fields completely developed or drilled, or sufficiently explored to permit reasonably accurate calculations) have so varied, that, at best, they are little more than "good guesses". This uncertainty of finding and estimating the supply of crude oil deposits has had the effect of making oil-production a migratory branch of the petroleum industry. It


has had to migrate to the shifting sources of crude oil accordingly as oil fields are depleted, and new ones are discovered.

Prior to 1900, more than ninety per cent of all crude petroleum came from oil fields east of the Mississippi River, most of it from the Appalachian region.9 Today, nine-tenths (88.8 per cent) of the crude oil produced in the United States comes from six states: Texas, California, Louisiana, Oklahoma, Kansas, and Illinois.10

Location of Refineries

One of the outstanding features of the present petroleum industry is the large proportion of the refining branch that lies outside the major oil-producing areas. Formerly, during the early years of the industry, refineries were small skimming or topping plants located in or near the principal oil-producing regions. As oil-fields were depleted, many refineries were forced to close when their supply of crude oil disappeared, and new refineries were continually being built wherever new and larger oil fields were discovered. This dependency upon crude oil supplies and the tremendous waste of capital investments were clearly recognized by the

10 See Appendix, Table 2. Cf. Investigation Petroleum Resources, pp. 12, 42, 43.
Standard Oil Company very early in its history. With large amounts of capital invested in refineries, the company found the development of a vast network of transportation facilities was less expensive than re-locating its refineries near the sources of raw materials.

Instead of relying upon the common carriers to transport crude oil from the oil fields to the refineries, the Standard Oil Company led the industry into the transportation field by developing its own system as an integral part of its business. Today, crude oil and refined products are now carried to-and-from the fields and refineries by facilities devised, owned and operated by the petroleum industry; it utilizes the railroad tank car, the tank ship, the tank truck, and a vast network of underground pipe-lines.

The inclusion of transportation functions, normally those of common carriers into the petroleum industry was motivated by economic considerations, and it is now typical of the modern large oil corporation to own or operate its own transportation facilities. "Gasoline and fuel oil may be transported 2,000 miles by pipe-line, and 3,000 miles by tanker with an increase in price (which) is likely to represent such an insignificant proportion of the final cost of the product that it may easily be outweighed by other factors."

11 Industrial Location and Natural Resources, p. 23.
The location of the refineries near consumer-markets, at great distances from the source of crude petroleum, even though the expense of obtaining the raw material is rather high,\textsuperscript{12} is economically more advantageous because there is so little loss involved in the processing of crude oil.\textsuperscript{13}

On the basis of industry location, petroleum refineries may be generally classed as market, seaboard and waterway, and field refineries. For the past twenty-five years, the tendency of the larger oil companies has been to locate their refineries with respect to the nearness or accessibility to consumer markets and to seaboard or waterway outlets, rather than near the source of crude oil supplies. Originally, such was not the practice. "At the outset transportation costs were inordinately high; the liquid was hauled at great expense by teamsters to points of consumption, or to rail or water transportation."\textsuperscript{14} As a result, outlying areas were at a disadvantage, and refineries were built near the producing areas in western Pennsylvania, "near the manufacturing belt, where supplies helped to reinforce the existing concentrations in location."\textsuperscript{15}

\textsuperscript{12} \textit{Appendix}, Table 6.
\textsuperscript{13} Cf. \textit{Industrial Location and Natural Resources}, p. 145.
\textsuperscript{14} Ibid., p. 23.
\textsuperscript{15} \textit{Loc. cit.}
The small, independent refineries -- approximately two-thirds of the refineries in the United States\(^{16}\) -- have followed the pattern of the larger companies of locating their refineries in consumer-market areas. While many small refineries still are located close to oil-producing areas, the trend now is evidenced from the fact that "in the last ten years there have been no new refineries built by independent companies close to the crude sources of supply, but at the market."\(^{17}\) It has been found to be more economical to build a refinery at the market than to build it in or near the oil-field region where the supply of crude oil is dependent on that particular region. When the productive capacity of the field decreases, the refinery will very likely have to cease its operations; whereas, the market-located refinery has a better opportunity to become a permanent installation.\(^{18}\)

The influence of the consumer-market, while not the sole determining factor affecting the location of the refinery, obviously exerts a greater "pull" than does the supply of crude oil. "Two principal factors tend to account for the location of important refineries near large consuming

\(^{16}\) [Appendix, Tables 3,4.]


centers rather than in crude oil producing areas. The first is that a long haul of crude oil by water or by pipeline is cheaper than a long haul of petroleum or its products by rail. The second is the necessity of marketing large volumes of by-products resulting from technological developments in refining gasoline. Consequently, many large refineries are strategically located at or near large consumption centers, especially on the Atlantic Coast, on the Great Lakes, or on important inland waterways rather than at or near the constantly shifting crude oil producing areas...

Regardless of where the refinery is located, however, geographical factors are also important, for the problem of transportation is ever present. Either it is a problem of getting the refined product to the market, if the plant is a field-refinery; or, it is a problem of transporting crude oil from the oil field to the refinery, if it is market-located. In the case of the market-located refineries, they are generally located in areas which provide easy access to water, rail and highway transport, and a terrain adaptable to pipe-line construction. This is true of a large percentage of the refineries where the companies own or operate their own transportation facilities. Although not necessarily

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Plate XI
Reconditioning Pipeline

Pipeline crew scraping old pipe dug up from river Atchafalaya to be re-conditioned and used again. This is purely a wartime measure occasioned by the steel shortage.
Melville, Louisiana

Photo by Rosskam
located in the heart of the consumer-market, their location is strategically selected.

Locations along the Atlantic, Gulf, and Pacific Coasts provide easy and inexpensive transport by pipe-line to carry the crude oil from the fields to the refinery; they also provide access to distant domestic and foreign markets by coast-wise and ocean-going tankers. If, as some refinery plants are, they are located inland near industrial areas, their supply of crude oil is generally transported from the field by pipe-line. In the few instances of large field-refineries, outlets to market areas are provided by gasoline or product pipe-lines.20

From the viewpoint of economy in transportation, the ideal location for a refinery is to "be located either at one end of the line, or at some point on the line where the flow must necessarily be broken, as from pipe-line to tanker on the Gulf Coast, or from tanker to tank car on the eastern seaboard."21

Until recently (since the late thirties), it has been more economical to transport crude petroleum over long distances, especially by pipe-line and tank ship, than it has been to transport refined petroleum products by rail

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or tank truck. But, with the development of pipe-lines for transporting gasoline, kerosene, fuel oil, and other refined liquid products from the refineries, it is likely that market-located refineries may lose some of their competitive advantages.\textsuperscript{22} In this connection, other factors to be considered in locating future refineries are the rapidity with which domestic supplies are being consumed in the United States, and the exploitation of large foreign oil-fields from which it is comparatively less expensive to import crude petroleum by ocean-going tankers.\textsuperscript{23}

Thus, it is apparent that the very different factors influencing the location of the production and refining branches are of fundamental importance to the structural organization of the petroleum industry. The geographical distance that has developed between these important branches of the industry because of these factors, have made it more feasible, economically, to adopt the integrated form of structure.

**Vertical Integration**

Generally speaking, the petroleum industry is composed of four main divisions which embrace activities in several industry fields: oil production (mining), transportation (commerce), refining (manufacturing), and marketing

\textsuperscript{22} Cf. Zimmerman, op. cit., p. 515.

(wholesale and retail trade). 24

Formerly, these various activities were carried on as separate businesses. With the rise of the Standard Oil Trust, it will be recalled, one of the features enabling it to achieve its successful monopoly was the control it gained over the transportation, refining and marketing branches of the industry. This pattern of economic organization, the integration of the several branches of the industry, has now become characteristic of the petroleum industry.

The fully-integrated petroleum company is engaged in the business of taking oil from the ground...transporting and refining it, and selling refined products to ultimate consumers." 25 However, all petroleum companies are not fully-integrated. Some have interests only in three branches and are generally referred to as "partially" or "semi-integrated" companies. Companies engaged only in one or two branches of

24 The Chase National Bank reported, in December of 1944, that the net investments of thirty leading oil companies were divided among the several divisions of the industry as follows: production, 48.2 per cent; transportation, 12.9 per cent; refining, 21.5 per cent; marketing, 15.3 per cent; and natural gasoline interests, 2.1 per cent. Cf. Harold B. Fell, V. Pres., Independent Petroleum Association of America, Independent Petroleum Company, p. 329. Also, Roy C. Cook, Control of Petroleum Industry by Major Oil Companies (Monograph No. 39), Temporary National Economic Committee, U. S. Senate, 76th Congress (Washington: Government Printing Office, 1941), Table 1, p. 1.

25 Ise, TNEC (Part 14), p. 7107.
the industry are "non-integrated"; for example, a company with only production and refining facilities, but which has no interests in transportation and marketing, is non-integrated, as is a company engaged in only one branch.

It should be noted, however, that a complete or fully-integrated company generally will not have a balance between the four branches; that is, the investments in each branch and the returns from each will seldom be equally divided among production, transportation, refining and marketing activities. As a matter of fact, this is usually the case, and many problems of the industry arise from the disproportionate investments in the several branches; particularly is this true of the larger fully-integrated companies which may, and frequently do, carry on marketing activities at a loss, depending upon their earnings from other branches to compensate for such losses. Furthermore, although full integration has undoubtedly precipitated the concentration of control among the larger companies, it should not be implied that a fully-integrated company is necessarily a large company.

26 Appendix, Table 6.

Integration and Concentration of Control

One of the most significant results of vertical integration in the petroleum industry has been the manner in which it has accelerated the growth of the modern multi-million dollar oil corporation, a consequence of which has been that control of the industry has become concentrated within a few large companies.

Despite its monopolistic position in the petroleum industry, the Standard Oil Trust never was fully-integrated to the same degree as the modern large oil corporations since it had only limited interests in oil-production. Although it is true that the success of the Standard Trust compelled a few of its strongest competitors to become integrated in order to survive the ruthless competition of the "Trust", it was not until after the dissolution of the "Trust" in 1911 that the fully-integrated company developed rapidly. Following the liquidation of the Standard Trust, a number of the Standard companies that had engaged in only one branch of the industry continued their operations in such a manner, and in such close cooperation with other Standard units, that for all practical purposes, their combined activities approximated full integration. "Subsequent to the dissolution,

28 "Prior to the dissolution of the Standard Trust, the only integrated companies of importance were Gulf, Pure, Sun, Texas, Union, and Associated Companies." Kemnitzer, op. cit., p. 38.
the integration was maintained for more than a decade by an undisturbed community of interest..."29 Other Standard companies were reorganized or were merged formally into large fully-integrated companies.

Integration was further stimulated because the dis-solution decree came at the propitious time when the automotive industry was beginning to develop, and the outbreak of World War I was imminent.

The technological needs of the War, and the perfecting of the internal combustion engine,30 which mushroomed the growth of the automotive industry, created unprecedented demands for petroleum products of gasoline and motor fuel. Under these favorable circumstances during, and immediately following World War I, other large, integrated oil companies appeared.31 "In the course of the quarter century since the famous Standard Oil decision of 1911, at first tentatively


31 Some of these new companies were Sinclair, Mid-Continent, Phillips, Shell, and Skelly Companies. Cf. Kemnitzer, op. cit., p. 38.
and hesitantly, but after the war with increasing boldness, these new enterprises have sought with a considerable measure of success to secure a share of the profits which the Standard Oil Company had made fabulous. Many have failed, but out of the scramble have arisen several new giants in the industry. "32 The control of the modern petroleum industry is strikingly similar in pattern to that of the former Standard Trust. Formerly, thirty-three companies of the "Trust" controlled upwards of four-fifths of the industry business; today, twenty companies comprised of reorganized Standard companies and former "independent" oil companies, now control the same amount of the petroleum business.34

In the petroleum industry, the process of integration has really been "a succession of integrally related industries," with the result that a few business units are "larger than found in most American industries."35 Yet the large, integrated corporations represent but a fraction of the

32 Watkins, op. cit., p. 32. In 1928, the Federal Trade Commission reported the existence of nine independents with an investment in excess of $100,000,000 each. See Petroleum Industry: Prices, Profits and Competition, pp. 61, 265.

33 Appendix, Table 1(a).

34 "8 Standard Companies and 12 Independents of 1914 today comprise the 20 majors. In 1904 Standard Oil ran 84.2% of crude petroleum to refinery stills; today (1944) the majors run 83.15%." Fayette B. Dow, Independent Petroleum Company, pp. 187-208. See also, Appendix, Table 7.

thousands of concerns included in the industry. For example, it is estimated there are between eighteen and nineteen thousand oil-producing companies, about four hundred refineries, thirty-one thousand bulk stations, and more than 240,000 service stations. In addition, there are numerous contract-drilling, truck, tank-ship, and pipe-line companies, and concerns specializing in various phases of geological and geophysical exploration work. While it may be true that a large percentage of these smaller companies are directly, or indirectly, owned or controlled by the so-called "majors", there are still a large number that are "independent"; the majority of which are non-integrated.

But, despite the large number of concerns in the industry, it has become increasingly more difficult to compete successfully with the "giant" corporations, largely because integration lends itself to mass production methods that are dependent, in turn, upon modern technology for efficient production. "The dictates of mass production have determined

36 The practice within the industry is to refer to these larger concerns as "majors", of which there are twenty, and to the others as "independents". These terms, "majors" and "independent", refer to size based upon total assets, and not to structure; some "independents" are fully integrated. See Appendix, Table 1, for list of companies generally classed as "majors".

37 Independent Petroleum Company, p. 245.

38 The Petroleum Almanac, pp. 107-108.
Plate XII

Crude Pipe Stills at Esso-Standard Refinery
Baton Rouge, Louisiana

Photo by Rosskam
the economic structure of the industry..."39 Mass production methods and the continuous improvements wrought by modern technology and scientific research involve expenditures totalling millions of dollars which few independent companies can afford, even if they are fully-integrated. The pattern of integration, now characteristic of the petroleum industry, is closely associated with the finance capitalism.

While integration does not necessarily mean that a company will become a "major", no major corporation, on the other hand, can expect to compete successfully unless it is fully-integrated. Mass production methods imply a continuous flow of goods at each stage from raw material to the finished product," and it follows, therefore, that the relations between any one of the stages of the industry and the other next to it are peculiarly close...If such be the case and such relationships are not provided by common ownership, they must be provided by contractual relations...But because of the close dependence of one phase of operation on another in the oil business, the integrated form of organization does help very greatly to insure the continuity of the enterprise and to stabilize such earnings as the skill of management is able to produce...Because of the rapid changes in oil technology, it is necessary constantly to spend money on research and

to invest capital in replacement...Without integration, oil companies would not be able to spend such large sums on re-
search and improvements.\textsuperscript{40}

In the very "bigness" of the petroleum corporations lie important social implications. The tremendous size of a relatively few corporations not only threatens the survival of the smaller enterprisers, but it tends to destroy the very competitive system of private enterprise which nurtured the growth of the petroleum industry. The larger the corporations, the more dependent they are upon science and technology for maintaining or increasing their methods of large-scale mass production. The progressive expansion of large operating units imparts, from the social viewpoint, a highly impersonal character to the transactions and relationships of the large corporation, and the social distance between the owners and managers -- the employers -- and the workers is widened. If unchecked, this expansion results in "the frustration of employees' instinct of workmanship, the de-
privation of creative interest and personal dignity in labor...
because this depersonalization of the conduct of economic affairs has largely removed from those who are supposed to direct them, the salutary checks of personal honor and re-
 sponsibility."\textsuperscript{41}

\textsuperscript{40} William S. Farish, Pres. Standard Oil Company (New Jersey), \textit{TNEC} (Part 17), pp. 9748-49.

Although it need not be implied that large corporations, nor monopolistic practices, inevitably flow directly from the process of integration, the available evidence in the petroleum industry clearly seems to indicate a trend toward the adoption of business practices highly suggestive, at least, of partial monopoly.\footnote{The Senate Committee on Small Business is investigating "Oil Exports and Prices"; the House Armed Services Subcommittee is planning "a full and complete study and investigation of shortages in, and methods used in distribution of fuel oil"; and the Senate Banking and Currency Committee plans hearings on "the distribution and sale of fuel commodities and rising prices of same in New England." \textit{Oil and Gas Journal}, XLVI (January 15, 1948), p. 53. Also, see \textit{Appendix}, Table 8, for list of other recent investigations of the petroleum industry.}

In its brief history, the petroleum industry has developed from the confused, disorganized industry of its first twenty years, through the next period of forty years under the dominant rule of the Standard Oil Trust monopoly, until today, in part due to the integrated character of its structure, the control of the "major" corporations has been virtually transferred to the financiers, investment bankers, and the holding companies.

The following chapter will consider briefly some of the factors that have tended to concentrate the control of the industry within this very small group of major oil companies, and some of the problems of the large group of independent companies.
CHAPTER 5

THE "MAJOR" AND "INDEPENDENT" COMPANIES

The social relevancy of the integrated company becomes more apparent as the relationship between integration and the concentration of control among the larger oil companies is made more clear.

While the degree of integration is an important factor, it should be emphasized that it is not the defining criterion which delineates the very large, the large, medium-sized, and small oil companies. "It is frequently assumed that an integrated company is necessarily a large company. This is an unjustified assumption...some small concerns are integrated units operating in all branches of the industry, whereas much larger companies are in only one branch."¹

To all intent and purposes, the very large companies all are fully-integrated. If the parent company of a huge corporation is not itself actually engaged in every branch of the industry, its subsidiary or affiliated companies will be found operating in each division. Thus, the end result is the same as it would be were the parent organization fully-integrated.² On the other hand, the countless thousands of

² Cook, op. cit., p. 4.
smaller enterprises represent all forms and combinations of structural organization from the fully-integrated company, to the non-integrated concern engaged in but a single activity. This would include individuals who own oil wells, and those who operate filling stations. Any attempt to classify all concerns of the industry according to their respective and varied structural organizations would yield a rather lengthy list of confusing and baffling classifications.

It is exceedingly difficult, therefore, if not impossible, to make generalizations concerning the social organization of the petroleum industry, simply from an analysis of integrated and non-integrated companies.

As new companies, which began as refineries, challenged the leadership of the former Standard Oil companies, the increased competition between these two groups of companies, and among the individual companies themselves, stimulated the process of integration. In order to enhance their chance of survival, the companies strengthened the weaker segments of their organizational structure in such a manner as to become complete units engaged in all operations from the oil well to the retail outlets at the filling station. This was accomplished by the acquisition of producing, transportation and marketing facilities which then insured them of a continuous supply of raw materials, and market outlets for their refined products.
What is of special interest and significance is the fact that while the large oil companies now control the several branches of the industry, the small independent enterprises that once dominated these branches have by no means disappeared. Generally speaking, the industry is divided into two groups. In the one group are the relatively few large corporations engaged in a competitive struggle with each other; yet so vitally interested in stabilizing both the crude oil production and the price structure that they cooperate to achieve these ends. In the other group are the overwhelming majority of small independent businesses whose total investments represent not more than one-third of the entire industry.

Typical of the independent is the oil operator who might have been a cattle man, bank president, laborer or farmer yesterday, who "in many instances views the business of crude oil production as a game of getting rich quick which he must quit as soon as 'the pile is made'."

Thus, the oil industry represents two economic philosophies: the old laissez faire philosophy of unrestricted competition stressing the rights of private ownership,

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3 Appendix, Table 20. Cf. Supra, Chapter 4, footnotes 37, 38, 39.
4 Appendix, Table 1.
5 Zimmerman, op. cit., p. 526.
regardless of other considerations; and the philosophy of corporate control. The former stems from the early history of the petroleum industry, while the latter "is an inevitable corollary of the evolution of giant corporations and of the growth of fixed investments which in the case of single corporations may amount to billions of dollars."^6

For the purposes of this study, then, the petroleum industry may be divided into two broad classes: "the petroleum industry is characterized by a relatively small number of large enterprises constituting probably two-thirds of the investment of the entire industry. The remainder of the industry is made up of thousands of small producers and marketers and several hundred refining companies."^7

The twenty largest units, with assets of more than $50,000,000 each, are commonly referred to as the "major companies";^8 the others, as "independents".

The "Majors"

Of the twenty major companies, four are primarily holding companies; the remainder are holding and operating

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^6 Ibid., p. 526. See Appendix, Table 1.

^7 TNEC (Part 14-A), p. 7706.

^8 The most commonly accepted group of majors comprises some twenty companies, a list of which, ranked according to their assets, and giving the date and place of their most recent incorporation, is given in the Appendix, Table 1.
companies, with six of them functioning principally as operating companies. Collectively, the majors represent more than seven hundred subsidiary and affiliated companies engaged in domestic and foreign business. The number of companies owned and controlled by individual major companies ranges from 12 to 122. For the most part, subsidiary companies are engaged in only one or two branches of the industry; not more than five per cent are fully-integrated.

The major companies have several characteristics in common: interlocking directorates, huge capital investments, dispersed ownership among thousands of stockholders but with actual control vested in a relatively few. Together, they control all branches of the industries, and their policies are reflected by the functions and activities of the American Petroleum Institute, the largest trade association in the industry.

From information gathered by the Temporary National Economic Committee of the U. S. Senate, it was revealed that the stock of many operating companies was held by two or more of the major companies. For example, one study of twenty-five operating companies showed the following: in thirteen cases, the stock of these companies was jointly held

9 Appendix, Table 1.
10 Appendix, Table 9.
11 Cook, op. cit., p. 4.
by two major companies; in six companies, the stock was owned or controlled by three majors; the stock of two companies was held by four majors; and, in the remaining four instances, the stock was owned or controlled respectively by five, seven, eight, and twelve major companies. Thus, through individually or jointly controlled subsidiary and affiliated companies, the assets of the majors, ranging from $62 million to $2,035 million, totalled more than nine billion dollars in 1939 -- about two-thirds of the entire industry investment of approximately $14,750 million.

Although the stockholders of most majors are numbered in the thousands, a striking feature about their corporate structure is the large amount of stock held by the hundred largest stockholders. In only three majors (Sun, Smelly, and Standard of Ohio), did the hundred stockholders represent as much as one per cent, and in no case more than three-and-one-half per cent, of the total stockholders; yet the proportion of stock held by these largest stockholders ranged from twenty-one per cent to eighty-nine per cent of the outstanding stock. Among the largest stockholders

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12 TNEC (Part 1-A), Table 7, p. 7774; JF. Cook, op. cit., pp. 3-4.
13 Appendix, Table 1.
14 Cook, op. cit., Table 2, pp. 3, 57.
15 "The 100 largest stockholders owned more than 1/5 of the shares in 17 companies, more than 2/5 in 9, more than 3/5 in 5, and more than 4/5 in 3." TNEC (Final Report), p. 23; see Appendix, Table 10.
were fifty-one individuals who held stock in three or more of the major companies, with most of their multiple holdings divided among the four principal Standard Oil companies: Standard Oil (New Jersey), Standard Oil of Ohio, Standard Oil of Indiana, and Socony-Vacuum. Six of the fifty-one individuals (12%), held stock in two of the four Standard companies; sixteen (31%), held stock in three of the companies; and twenty (40%), held stock in all four companies.16

It is also interesting that some sixty-eight investment trusts, corporations, and banking houses were listed among the larger stockholders of the major companies. These financial concerns, two-thirds of them, held stock in from five to ten of the major companies, and none held stock in less than four of the majors.17 Further evidence of the degree to which the control of the majors is highly concentrated among a small minority of stockholders is indicated from the proceedings of their annual meetings. At these meetings of the stockholders, the officers "voted an average

16 "Members of the Rockefeller family and foundations established by the Rockefellers were in a controlling minority position in at least 6 of the major companies, holding 7.1% of the voting stock in Atlantic Refining, 13.8% in Standard of Indiana, 16.5% in Standard (New Jersey), 16.6% in Standard of California, 20.8% in Socony Vacuum, and 24% in Ohio Oil." TNEC (Final Report), p. 23; also TNEC (Part 14-A), Table 9, pp. 7776-7779.

17 TNEC (Part 14-A), Table 9, pp. 7776-7779.
of 99.3 per cent of the common stock voted."\(^{18}\)

From the view of corporate control, then, it appears a number of the majors are interrelated through common-stock ownership, through joint-ownership of subsidiary and affiliated operating companies, and that the officers exercise a rather complete control over the voting commonstock.\(^{19}\)

With respect to the control exercised by the major oil companies over the operations of the several branches of the industry, it "appears to be just as complete today as it was in the case of the Standard Oil Trust under Rockefeller. However, the methods of control are somewhat different today."\(^{20}\) The extent to which the majors dominate the various phases of the petroleum industry is graphically depicted in Figure 1.

The following concisely summarizes the data presented in Figure 1:

- Twenty companies had 66.7 per cent of the total industry investment.
- Twenty companies had 29.4 per cent of the producing wells.
- Twenty companies had 61.3 per cent of the total crude oil production, or nearly twice that of their share of producing wells which indicates they had the larger portion of the flowing wells.

\(^{18}\) Iss, TNEC (Part 14), p. 7105.

\(^{19}\) Loc. cit.

\(^{20}\) Cook, op. cit., p. xi.
FIGURE 1.
POSITION OF MAJOR OIL COMPANIES IN THE PETROLEUM INDUSTRY
(PERCENT)

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL INDUSTRY INVESTMENT</td>
<td>66.7%</td>
</tr>
<tr>
<td>PRODUCING WELLS</td>
<td>29.4%</td>
</tr>
<tr>
<td>CRUDE OIL PRODUCTION</td>
<td>61.3%</td>
</tr>
<tr>
<td>CRUDE OIL TRUNK PIPE-LINE MILEAGE</td>
<td>69.0%</td>
</tr>
<tr>
<td>TOTAL CRUDE OIL PIPE-LINE MILEAGE</td>
<td>71.8%</td>
</tr>
<tr>
<td>GASOLINE PIPE-LINE MILEAGE</td>
<td>96.1%</td>
</tr>
<tr>
<td>OIL TANKERS</td>
<td>84.1%</td>
</tr>
<tr>
<td>REFINERIES</td>
<td>34.9%</td>
</tr>
<tr>
<td>DAILY CRUDE OIL REFINING CAPACITY</td>
<td>82.2%</td>
</tr>
<tr>
<td>DAILY CRACKING CAPACITY</td>
<td>85.8%</td>
</tr>
<tr>
<td>CRUDE OIL RUNS TO REFINERY STILLS</td>
<td>63.2%</td>
</tr>
<tr>
<td>GASOLINE PRODUCTION</td>
<td>64.6%</td>
</tr>
<tr>
<td>GASOLINE STOCKS</td>
<td>56.8%</td>
</tr>
<tr>
<td>DOMESTIC SALES</td>
<td>80.0%</td>
</tr>
<tr>
<td>WHOLESALE BULK STATIONS</td>
<td>69.6%</td>
</tr>
<tr>
<td>RETAIL FILLING STATIONS</td>
<td>28.8%</td>
</tr>
</tbody>
</table>

Sources: Appendix, Table 7.
Fifteen companies had 89.0 per cent of the all-important crude oil trunk pipe-line mileage.
Twenty companies had 71.8 per cent of all crude oil pipe-line mileage.
Seventeen companies had 96.1 per cent of all gasoline pipe-line mileage.
Fifteen companies had 84.1 per cent of the oil tankers.
Twenty companies operated but 34.9 per cent of the refineries.
Twenty companies had 82.2 per cent of the daily crude oil refining capacity.
Twenty companies had 85.8 per cent of the daily cracking capacity.
Nineteen companies had 83.2 per cent of the crude oil runs to the refinery stills.
Nineteen companies had 64.6 per cent of the gasoline production.
Nineteen companies had 56.8 per cent of the gasoline stocks.
Twenty companies had 80.0 per cent of domestic sales.
Eighteen companies had 69.6 per cent of the wholesale bulk stations.
Eighteen companies had 28.8 per cent of retail filling stations.  

Other factors that strengthen the position of the majors are their interests in crude oil reserves and petroleum patents. In 1938, the major companies owned approximately seventy per cent of the proven oil reserves, and, in 1946, "the ownership of United States reserves by the majors is steadily increasing." 

21 "The figures for filling stations are for the year 1938 which is a sharp decline from 1933 when they operated 73.2% (125,372). The decline resulted mainly from leasing stations to individual operators under the so-called Iowa plan, the principal announced reason for which was to escape heavy State chain-store taxes and payments for social security taxes." William H. England, chief economist, Federal Trade Commission, Independent Petroleum Company, p. 564.

22 Cook, op. cit., p. 11; Cf. Shatford, TNEC (Part 15), pp. 8532-33.

Most independent oil companies have to pay royalties for the use of important industry patents which the majors own and share among themselves through joint ownership of special patent companies. "For example, the Hydro Patents Company is jointly owned by the Texas Corporation, the Pure Oil Company, the Standard Oil Company (Ohio), the Skelly Oil Company, the Gulf Oil Corporation, and the Standard Oil Company (Indiana); the five other important patent companies are each owned jointly by from two to five of the majors."24

Perhaps the general picture regarding the control of the petroleum industry concentrated in the hands of the majors, from the point of view of competition, "would approximate what economists have come to describe as monopolistic competition."25

Before concluding this discussion of the major companies, some brief mention should be made of the manner in which the "largest trade association in the petroleum industry"26 is utilized by the majors as a "policy clearing-house", and as an agency by which the government and the public is kept informed of the major oil companies' policies. This association, the American Petroleum Institute, has for its

24 Cook, op. cit., p. 31; see Kemnitzer, op. cit., "Patents" (Ch. 13), pp. 165-179.

25 Ise, TNEC (Part 14), p. 7106.

26 TNEC (Part 14), p. 7097.
objectives: to promote cooperation with the government in matters of national concern, to foster domestic and foreign trade, to promote the interests of all branches of the industry, and to promote the interests of the individuals and arts and science connected with the petroleum industry.  

Policies and management of the affairs of the Institute are established by officers, a board of directors, and an executive committee; the officers are elected by the board of directors, and the executive committee is composed of six executive officers and nineteen members selected or appointed from the board of directors.

The Institute, founded in 1919 under the leadership and guidance of Standard Oil representatives, has a membership estimated to be about 5,000 which includes representatives from the independents as well as the majors. It is an industry-wide association and membership is opened to individuals "21 years or older; of high character and good standing; and having direct interest in the petroleum industry or any allied industry," but, "as the large companies occupy an important position in the industry, it is only to be expected that they would have many members on institute.

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28 Loc. cit.

29 Loc. cit.
committees."

The membership of the important executive committee indicates how close the interests of the Institute are in harmony with, if they are not actually those of the major oil companies. Currently, at least fourteen of the seventeen directors are major oil company representatives.31 The activities of the Institute also are largely financed by the major companies. In 1937, while the income from the $10 membership fee amounted to about $50,000, the annual budget of the committee was around $600,000, with the salaries of the president and vice-president being $75,000 and $50,000 respectively.32 The difference between income and expenses was defrayed by contributions from the large oil companies.33

One of the most important influences upon the policies of the Institute is the fostering and financing of public relations activities by the majors. Remembering that the petroleum industry, born during the era of laissez-faire capitalism, still cherishes the traditions of the American pioneer and "rugged individualist", its fear of governmental control is understandable and not at all surprising.


31 Appendix, Table 11.

32 Kemnitzer, *op. cit.*, p. 29.

"I want to remind you that we are witnessing a worldwide trend toward government domination of business...In our country this drift toward stateism is not yet advanced as in other parts of the world, but it has been particularly evident in the past decade..."34

"As leaders in the petroleum field, I am sure you are confident that, under the kind of freedom we have long enjoyed in America, and under which our industry has grown up, we can do a better job than can possibly be done under any system of planned economy..."35

With an increasing proportion of the population of the world becoming more dependent upon the petroleum industry for gasoline, motor fuel, and fuel oil for heating purposes, any fluctuations in price, or a shortage of petroleum supplies immediately brings the petroleum industry into the spotlight of public opinion that was so intensely focused upon the Standard Trust of former years. The industry fully recognizes the possibility of increased governmental control if the trend of public opinion continues toward accepting the belief that "crude petroleum, the raw material of the industry, is


an irreplaceable natural resource, so essential to our economic life today, and so necessary in national defense, that its conservation is almost inevitably a function of the State.\textsuperscript{37}

During 1946, the American Petroleum Institute sponsored a nation-wide survey of public opinion which revealed alarming results to the Institute: sixteen per cent of those polled "believed the government should own and operate the oil industry in the United States."\textsuperscript{38}

Two other privately conducted opinion surveys showed similar results.\textsuperscript{39} One reported twenty-two per cent favored either ownership and operation, or more regulation by the government; the other, conducted in Texas, "where you would think the oil industry would stand in high esteem",\textsuperscript{40} showed twenty-five per cent of the people thought the government would do a better job of finding and producing oil, and thirty-seven per cent believed government would market petroleum products at lower prices than now prevailing.

\begin{thebibliography}{99}
\item \textsuperscript{37} Ibid., p. 7107
\item \textsuperscript{38} Haslan, \textit{op. cit.}, p. 16.
\item \textsuperscript{39} Loc. cit.
\item \textsuperscript{40} Loc. cit.
\end{thebibliography}
As a result of these surveys, the Institute has again re-vitalized its public relations department, first organized in 1924. At that time, it provided material for speeches to be made to civic organizations. One of its primary objectives was to dispel the idea there was "some national or international concern known as 'The Standard Oil Company'."

According to Cook, "the Institute abolished the committee on public relations on May 31, 1940 for fear of action for violation of the anti-trust laws." However, after the results of its nation-wide survey, the Institute organized a national advertising campaign in August 1946 utilizing "every conceivable medium" to counteract the prevailing unfavorable public opinion. It hired a public-relations counsel (Fred Eldean Organization, Inc.) and employed the Ivy Lee-T. J. Ross Company.

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41 Kemnitzer, op. cit., p. 38.
44 Oil and Gas Journal, November 15, 1947, p. 208.
the chairman of the committee on public relations, "pointed out that while the program for the past year had been financed by a few companies, more wide-spread participation was necessary in the future. He said the Institute would continue to serve as a clearance agency as a convenience to the industry." That the "few companies" financing this campaign were major oil companies may be inferred from the implied costs of the following activities during the first ten months: during the first three quarters of the year, one million pieces of literature were distributed; two million pieces were distributed during the first month of the fourth quarter; and an additional two million pieces of editorial material (booklets, leaflets, posters, and suggested speeches) were ordered through the tenth month. The Public Relations Operating Committee, with an elaborate national organization for carrying out the program "unprecedented in industry public-relations," is heavily weighted with major oil-company representation.

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46 Lovejoy, op. cit., p. 188.
47 Oil and Gas Journal, November 15, 1947, p. 206.
48 Ibid., p. 208.
49 Appendix, Table 12.
It is significant that, while the American Petroleum Institute purports to be a trade association representing all segments of the petroleum industry, it would appear its functions are really in the interests of a special group, the majors. Certainly it provides these corporations with the means whereby their policies may be kept in harmony, if not actually uniform, with each other. "The API performs in the industry a service which the companies could not in policy or even sometimes under law perform for themselves."50

Structurally, the Institute apparently has become the agency through which the public and the government are recipients of influential material, facts, and opinions of the major companies concerning their policies and practices; and, as such an agency, it must be regarded as an integral part of the social organization of the major oil companies, the dominant group within the petroleum industry.

The "Independents"

Although there is little disagreement within the industry as to which are the major oil companies, recent hearings before a Senate Investigating Committee51 unveiled differences of opinion with respect to what companies should

50 Kemnitzer, op. cit., p. 29.
be considered "genuine" independents. The president of The Independent Petroleum Association of America, for example, would exclude the cooperatives. The representative of the cooperatives testified, that while cooperative oil companies were fully-integrated, "the word 'independent' in this (petroleum) industry refers to those individuals and those companies which are entirely free of any control by the major companies, or the financial interests related to the major companies (thus) our cooperatives are 'independent'." Another witness summarized rather succinctly the general opinion expressed throughout the hearings:

"There are major companies whose executives vigorously assert that their companies are 'independent', and their statement is true in the sense that they conduct their own business in their own way, and do not follow, unless they choose to, any pattern set by their competitors. But this is not the widely understood definition. 'Independent', as the oil industry understands the word, means a company that is relatively small and largely unintegrated. The 'majors' are engaged in production, transportation, refining, and marketing -- that is, they are to a substantial degree integrated. Some of the independents have a partial degree of integration. Integration, in its balanced operations, its efficiency and its economies, is the

52 B. A. Hardy, Independent Petroleum Company, pp. 8-10.

53 John Carson, Director, Washington Office, Cooperative League USA, and National Cooperatives, Inc.

54 Carson, Independent Petroleum Company, pp. 495-496.
goal of small as well as large oil companies, and, in notable instances, explains the growth from the independent of but a few years ago to the major of today.*55

The lack of unanimity among the representatives of the independent oil companies is also indicated by the number, and the varied types of trade associations representing the interests of producers, refiners, and marketers. Each group has its own national and regional organizations.56

The division of the industry into major and independent companies does not imply necessarily that each group has entirely different objectives nor that their interests are in conflict with each other. For example, on such questions as governmental control, competitive private enterprise, oil imports and exports, price control, etc., the position of each group on these issues often is found to be in harmony with each other. "It is erroneous to assume the oil industry is divided into two clearly defined opposing and antagonistic groups -- 'independents' and 'majors'..."57 Recognizing the various structural shadings of the petroleum companies, one writer suggests three broad groupings with respect to the


56 A partial list of trade associations represented at the Senate hearing on the Independent Petroleum Company is given in the Appendix, Table 5. A more complete list may be found in David D. Leven, Done in Oil (New York: Ranger Press, 1941), p. 317.

size of financial assets: "major oil concerns with assets over $50,000,000, minor oil companies with assets less than $50,000,000, and individuals (who are) producers, refiners, and marketers." However, as indicated previously, the complicated structure of the industry does not lend itself readily to any such arbitrary classification; there would always be some exceptions, and, for purposes of this study, it would be futile to attempt to group the innumerable concerns according to their respective economic organizations.

The independents are a heterogeneous group. They include the fully-integrated and the non-integrated company; the individuals who own or operate oil wells and filling stations; and even such "quasi-monopolistic" organizations such as the Halliburton Oil Well Cementing Company. The independents today are quite different from those that opposed the old Standard Oil Trust. Following the dissolution of the "Trust", the decade 1911-1919 was a period of great expansion and prosperity for both the large and small concerns of the petroleum industry. Then came the depression years of 1920-1921 when the price of crude oil dropped from $3.50 to $1.50 a barrel within a few months.

58 Hager, op. cit., p. 47.
59 Through the control of vital patents, Halliburton does about 90% of all oil-well cementing. Cf. Fell, Independent Petroleum Company, p. 71
Many of the small, flourishing concerns failed; others were merged or consolidated into larger integrated companies; while the large major corporations, successfully weathering the depression, increased their control over the entire industry. Although free competition and private enterprise did not disappear completely, the position of the independent or small concern has become increasingly precarious.

What is obvious is the trend toward an increasing amount of petroleum business being concentrated in the large, fully-integrated corporations. This trend is threatening the position of the companies outside the group of the majors, and, regardless of integrated or non-integrated features, it will have a consequential effect upon the social organization and industrial policies of the entire industry.

The Independent Producer

Originally, the petroleum industry was characterized by individualistic, adventurous, and optimistic oil men. In many ways, they remind one of the farmer who takes pride in his crop as the product of his own toil, and, who, despite failures beyond his ability to control, hopefully plans for the next year; or of the pioneer who settled amidst the discomforts of the undeveloped West and built his home in isolated areas. The early conditions of the oil industry required

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60 Cf. Watson Snyder, Department of Justice, Chairman Joseph O'Mahoney, and Alfred Jacobsen, Independent Petroleum Company, pp. 51-64, 407.
men of the vigorous, out-of-door type who were willing "to take a chance", and who were able to continue the search for oil in spite of frequent and disappointing failures.

Few of these traditional oil men are left now. The entrance of technical and professional men into the industry, the technological improvements, and the large-scale operations of the integrated major companies have tended to "de-glamorize" the industry and to make it a highly technical, complex, and efficient and impersonal organization. "The modern type of oil man is younger and softer than the old school oil man...Oil men who head the smaller concerns are more like the oil men of the old school. They are generally in closer touch with actual field operations and remain less impersonal, are far more colorful in their speech and habits, and allow themselves freer expressions of opinions than do the officials of the large oil companies. Even this condition is changing, and the newer crop of oil men are becoming more and more thoroughly modern businessmen." 61

The independent producer, perhaps more so than any other group in the petroleum industry, represents the ideologies of the traditional or "old school" oil men. They pride themselves as being "rugged individualists who dare to assume the greatest risks." 62 They claim to be the "true pioneers"

61 Hager, op. cit., p. 42.
who have sought "to dignify the individual ever since the
beginning of the oil industry."\textsuperscript{63}

Today, there are probably somewhere between nineteen
and twenty thousand independent oil producers operating
some 350,000 oil wells. During the first half of 1945, they
drilled 68.1 per cent of all completed oil wells, 70.5 per
cent of the "wild-cat" (exploratory wells), and 61.8 per
cent of all successful wild-cat wells.\textsuperscript{64} The modern inde­
dependent producer is the product of a mixed heritage of "bank­
ers, merchants, and land-owners (who) invested in the de­
velopment of fields and remained to make that their occupa­
tion."\textsuperscript{65} Or a driller, a pumper, or a drilling contractor
might obtain a lease and start drilling. Thus, the independ­
ent producers are comprised "of many elements and talents...
and a large majority of them have had practical experience
in the oil fields."\textsuperscript{66}

Although the influx into independent producing has de­
clined,\textsuperscript{67} the tradition is for the sons to follow their fathers

\textsuperscript{63} Russell Brown, \textit{Independent Petroleum Company}, p. 22.
\textsuperscript{64} Ibid., p. 31.
\textsuperscript{65} Ibid., p. 23.
\textsuperscript{66} Loc. cit.

From 1939 through 1943, there was a further decrease of one-third (32%), and the downward trend was continuing during the first quarter of 1944 with a loss of 500 concerns. See R. Brown, \textit{Independent Petroleum Company}, pp. 33-34.
into the business. The industry is "just old enough to include third as well as second generations"68 and those succeeding to management now are generally more technically trained "with school vacations spent in the oil fields where academic knowledge (is) given clear and definite meaning."69

Contrasting the independent producer with the majors, one representative of the independents has said:

"They (the independents) lack the inhibitions that surround the large companies. Put any man in charge of the affairs of a large corporation, and if he is worthy of the trust imposed upon him by the stockholders, he becomes conservative and cautious. He takes as few chances as possible. ...The independent is not so bound. He may have a few stockholders but they have invested with a full understanding that there are risks in the partnership. He has no stock listed on the exchange and no bonds. He is free to go ahead and finance, in any legal way he can, any venture he decides to engage in. He uses the scientific findings (but) many a valuable addition has been made to the oil reserves of the Nation because some independent drilled on the basis of a 'hunch'."70

The Independent Refiner

The group of independent refiners, for the most part composed of small non-integrated companies, operated more than two-thirds of all refineries in the United States during the

68 Brown, Independent Petroleum Company, p. 28.
69 Loc. cit.
70 Ibid., p. 34. Bailey, Independent Petroleum Company, p. 68.
first quarter of 1945, \textsuperscript{71} but they received only one-sixth of all crude oil run to the stills in 1944.\textsuperscript{72} Of the 266 independent refineries, eighty-seven per cent had refining capacities of less than 10,000 barrels daily. Sixty-nine per cent had refining capacities of less than 5,000 barrels, and only eleven per cent had refineries with capacities greater than 20,000 barrels; none had a capacity of as much as 30,000 barrels.\textsuperscript{73}

Even under conditions of normal oil production, the independent refiners usually operate at only fifty per cent of their capacity, compared with eighty-five per cent for the majors.\textsuperscript{74} When crude oil production is slack, the small refiner often is forced to cease operations, unless, in competition with the majors for the limited supply of crude oil, he is willing and able to pay rather high premiums.\textsuperscript{75} The independent refiner is further at a disadvantage if he should wish to expand his plant or to improve his refining process. Plant expansion is an expensive proposition. Without an adequate research staff to develop new refining techniques, the independent has to pay sizeable royalties to the

\textsuperscript{71} Appendix, Table 3.  
\textsuperscript{72} Appendix, Table 7.  
\textsuperscript{73} Appendix, Table 4.  
\textsuperscript{74} Cook, \textit{op. cit.}, p. 34.  
\textsuperscript{75} Hager, \textit{op. cit.}, 380.
majors for the use of patents which the latter control.\textsuperscript{76}

The term "independent" as applied to the refining branch, means very little in actual practice, except that it denotes interests other than the majors own and control the refinery. Insofar as operating independently is concerned, the independent is really quite dependent upon the majors. Although the independent producer is willing enough to sell his crude oil to the independent refiner, the cost of transportation is a serious problem. It is much more expensive to transport petroleum by rail or truck than by pipe-line or ship,\textsuperscript{77} but, since the independent refiner has very little capital to invest in pipe-lines or tank ships, he frequently transports his crude oil through pipe-lines owned by the majors. He must pay for the use of these pipe-lines, and, even though it may be cheaper than rail or truck transport, the independent refiner is placed at a competitive disadvantage with his major company rivals. Thus, with competition very keen between him and the majors for crude oil supplies and market outlets, the typical independent refinery, with an investment of from two to six million dollars, is "a hazardous and marginal enterprise."\textsuperscript{78}

\textsuperscript{76} Cook, \textit{op. cit.}, pp. 31, 51; \textit{Cf. Supra}, Ch. 7.
\textsuperscript{77} Appendix, Table 13.
The capital invested in the independent refinery usually is furnished by a relatively small number of persons who share directly in the policy-making and management of the company. The average independent is not very large and it generally affords an opportunity for personal and "close supervision of personnel and operations." 79

Unlike the independent producer, where ownership and management frequently is passed on to second generations, the independent refinery often is sold or it is consolidated with outside interests upon the death or retirement of the owner. The principal reason given is the severity of estate taxes on these individually and family operated properties. Such "estate taxes would take a third or a half on his death." 80 Anticipating these taxes often results in the sale or consolidation of the property which, in turn, "promotes the growth of large enterprises, in many of which ownership and management are unrelated..." 81 When the independently owned refinery is sold, it is bought -- in the majority of cases -- by a major company. For example, in the 1928-1930 period, the majors purchased all the independent refineries along the east coast. 82 It follows, then,

79 Ibid., p. 195.
80 Ibid., pp. 196-197.
82 Walsh, TMEC (Part 14), p. 7334.
that with each such sale, the position of the majors becomes stronger, while, conversely, that of the independents is weakened. This trend in the refining branch indicates the gradual departure from the traditional system of owner-operator plants to a system of wide-spread ownership among thousands of individuals whose interests in the business are so relatively small that management is delegated to a selected group of executives.83

The independent refiner, like the independent producer, represents himself as the "spirit of free enterprise".84 "The independent refiners believe that small business is a necessity on which the life of free-enterprise system depends...and their continuation in business is important to our welfare."85 But aside from exceptional cases, the business life of the small independent refiner is an uncertain and short one. More often than not he builds his refinery in the producing area in order to be close to the source of his crude oil supply,86 and thus is more or less dependent upon the productive life of the particular field in or near which he locates. One outstanding illustration is the case of the East Texas oil field, one of the largest in the country. During the period of its full production, 1930-1938,

84 Dow, Independent Petroleum Company, p. 194.
86 Dow and Fell, Independent Petroleum Company, pp. 197, 338.
115 refineries were built, the greatest number in operation at one time was seventy-four during 1935. Only one of these refineries was built by a major company; yet, in 1939, only three independent refineries were operating in the East Texas oil field. 87

The Independent Marketer

Earlier mention of the complexities of the structural aspects of the petroleum industry is further emphasized in the following description and discussion of the marketing division. This branch of the industry, accentuating the perplexities with respect to structure, indicates how difficult it is to generalize the social relations of the overall industry without an awareness and understanding of the manner in which the several branches have contributed to the very involved social organization of the petroleum industry.

The marketing branch is the largest division in the number of enterprisers and the number of persons employed. 88

It is through this division that the general public has its

87 Cook, op. cit., p. 33.

88 Petroleum Administration Board, op. cit., p. 19. Estimates of the employment in the various branches of the industry are: Production, 178,000 in 9,000 concerns; Transportation, 42,000 in 83 concerns; Refining, 104,000 in 485 concerns; and Marketing, 697,000 in 274,000 concerns. Petroleum Almanac, pp. 65, 83.
most direct contact with the industry, and, in the minds of
the public, the petroleum industry is characterized by the
policies and practices of the marketers. Marketing prob-
lems such as price-fixing, price-wars, and other alleged
malpractices of the majors to gain control of the whole-
sale and retail market outlets are too intricate to be sum-
marized briefly. Furthermore, such problems have been the
subject of numerous investigations; therefore, this dis-
cussion will primarily concern itself with the structural
aspects of the independent marketers.

Since marketing activities are carried on by inte-
grated major companies, and by integrated and non-integrated
independent companies, the situation in the marketing branch
of the petroleum industry is by no means simply explained.
The structure of the marketing branch is made more confound-
ing by the division and subdivision of its wholesale and re-
tail functions. To illustrate: "...the term 'fully integrated
marketer' will be used to refer to an organization which has
a stake in each of the three groups of marketing functions:
manufacturers', wholesalers', and retailers'. A 'partially
integrated marketer' will mean an organization having a stake

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89 Sidney A. Swensrud, V. Pres., Standard Oil of Ohio,

90 *Appendix*, Table 8.
in more than one of the three groups of activities but not in all three; and the term 'non-integrated marketer' will mean an organization which performs only one group of functions.\footnote{Swensrud, TNRC (Part 15), p. 8676.} Manufacturers' functions include advertising, market studies, price-structure analysis, setting prices, extension of credit, etc., -- the "very large number of non-physical functions that must be performed."\footnote{Ibid., p. 8399.} Wholesalers' functions are those connected with getting refined products from the refiner to the retailer. The retailers' functions are those associated with selling to the consumer.

To avoid confusion, since the terms "integrated", "partially integrated", and "non-integrated" have heretofore been used to describe the over-all industry structure, the degree to which a marketer carries on the various marketing functions will be connotated by the terms "complete marketer", "partially complete marketer", and "incomplete marketer".

The situation with regard to the marketing division can be simplified somewhat, in the interests of clarity and for the purposes of this study, if the following discussion is confined to the non-integrated independent companies; that is, those companies which are engaged only in marketing, or refining and marketing. It would be an unusual case where
an independent producer will have marketing facilities without an interest also in refining, and while a few large independent companies own or operate both transportation and marketing facilities without engaging in refining or production, such companies are the exception rather than the rule.

In limiting the discussion to non-integrated companies, it is recognized that a number of marketers will thereby be excluded because of interests in other branches of the industry. However, since the exclusion of integrated companies -- both majors and independents -- will detract little from the complex structure of the marketing division; and since the relationship and influence of the structural aspects of the marketing branch upon the social organization of the petroleum industry can be demonstrated without the integrated companies, limiting the discussion to non-integrated marketers will serve the purpose of this study.

Two things should be kept in mind with regard to the non-integrated marketer: first, although the non-integrated refiner-marketer, wholesaler, and retailer have quite different functions, they are not to be construed as separate branches of the industry; and, secondly, reference to tank-truck transportation utilized for local deliveries from refinery to bulk plant, and from bulk plant to retail outlet, should be distinguished from "transportation in general".93

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In other words, the use of transport truck in marketing operations, for example in the case of the wholesaler, does not imply necessarily that he is engaged in the transportation branch of the industry.

The Refiner-marketer

The refiner-marketer, since he will have to assume the functions of the manufacturer, and one or both of the wholesale and retail functions, will be either a "complete marketer", or a "partially complete marketer". In the former case, he may own or operate wholesale and retail outlets either directly or through subsidiary or affiliated companies; the latter case is more typical, where he owns or operates only wholesale bulk stations. It is not necessary to dwell too long on the refiner-marketer because the problems of the independent refiner already have been discussed, and those of the wholesaler and retailer will subsequently be taken up more in detail.

The Broker or Agent

The broker, of whom there were only 146 in 1939, operates between the refiner and the wholesaler. Most frequently he serves as a salesman or sales agency for the non-integrated refiner, especially those who have a limited, or no sales force. Generally, the broker deals only in large

95 Petroleum Administration Board, op. cit., p. 32.
quantities as originally shipped from the refinery, such as tank-car or barge-cargo lots. He is usually an "incomplete marketer" who maintains no storage or distribution facilities, and canvasses only the wholesale trade for its bulk orders. Although he is an independent marketer, he may solicit orders for the "unbranded" products of the majors.

The Wholesaler

In 1939, there were 32,323 wholesale marketers, of which 30,825 were petroleum bulk station (or terminal) operators. It is difficult to ascertain from these data exactly how many stations were operated by independent marketers, particularly if the criterion of the National Oil Marketers Association, an independent marketers' trade association, is used: "whether a jobber is independent or not is whether he owns and operates his business," a criterion more limited than the one used in this study.

The National Council of Independent Petroleum Associations estimated there were some 12,000 independent jobbers.

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96 Shuman, op. cit., p. 147.
97 Swensrud, TNEC (Part 15), pp. 8681-8682; also Appendix, Table 17, paragraph 1B.
99 Hadlick, TNEC (Part 16), p. 9156.
100 Thatcher, Independent Petroleum Company, p. 557.
while the Petroleum World, a trade magazine, listed 9,926 independent marketers or jobbers in 1938. Since the majors owned 19,783 bulk stations in 1938, it is very probable that a number of these stations were leased on a commission basis, and that such jobbers were excluded from the above estimates because they did not own and operate the stations. Such a practice seems indicated from the 1939 Census of Business. Only 6,053 bulk stations are reported as being operated by salaried employees (an indication of being non-independently owned), but 17,530 wholesale units were reported as "commission stations".

The average wholesaler operates a bulk plant on the outskirts of a large consumer area, located near rail or water terminal. The bulk station has several large storage tanks for gasoline and fuel oil, and a warehouse for the storage of bulk products such as motor oil, grease, tires, etc. The total investment in bulk stations throughout the United States runs into the millions of dollars, ranging anywhere from $5,000 to $500,000 invested in a single station.

101 Swensrud, TNEC (Part 15), p. 868; The Petroleum Register owned by Petroleum World reported the number of independent jobbers as follows: 1918: 1,580; 1923: 2,259; 1928: 4,508; 1933: 8,273; 1938: 9,926.
102 Ibid., p. 8402.
104 Hadlick, TNEC (Part 16), p. 9152.
The wholesaler also operates a fleet of tank trucks for deliveries to his customers. He buys his supplies in tank-car or barge-cargo lots directly from the major or independent refiners, or indirectly through a broker. Principally, he sells gasoline, kerosene, fuel oil, naptha, greases, and lubricants. Many now deal in tires, tubes, and other automobile accessories, but "whoever operates the bulk station, the functions are very much the same. He has to solicit customers...to make deliveries...to collect credit accounts...and to supply the dealer and retailer with his pumps and underground storage tanks."

A distinction generally made with regard to wholesalers is to divide them, according to their functions, into two groups: "distributors" and "jobbers".

The distributor is not a "complete marketer", for he has none of the manufacturers' functions to perform. He frequently is a "partially-complete marketer" in that he may own or operate retail outlets. The majority of distributors, however, are "incomplete" marketers who have no retail outlets of their own. They lease their bulk plants from integrated companies, for the most part major companies, and

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105 See, cit.
107 Ibid., 8403.
become "authorized wholesalers" by contractual agreements, such as contract FW-22, No. 50, of the Standard Oil Company of Ohio:

"The seller hereby agrees to sell and the buyer hereby agrees to buy, receive, and pay for its entire requirements during the initial period of this agreement, and during any subsequent annual extension period all grades of gasoline, motor oils, and greases for use in buyer's wholesale business in petroleum products." 109

Presumably, distributors are not salaried employees of their suppliers, but are independent proprietors of their own establishments that are leased from integrated companies, and who operate their businesses on a commission basis. "They are run as independent units. They each have their own manager; we don't interfere in the management. They are conducted like any other jobbing enterprise." 110 Despite this statement by an official of a major company, it would appear that "authorized distributors" are considered to be "agents" of the major companies. From the answers of eight major companies reporting to the THEC on the question about the "methods of domestic gasoline sales", the following represents the average practices of these companies: 14.7 per cent of domestic sales of gasoline were to "jobber", 1.4 per cent were to "retail distributors", and 60.2 per cent were to "retail outlets". 111 Ordinarily, it would be expected

109 THEC (Part 15), 8486.
110 Swensrud, THEC (Part 15), p. 8488.
111 Appendix, Table 14.
that jobbers and distributors would have had a greater proportion of the sales in their roles of "middlemen" between the refiner and the retail outlet. The large proportion of domestic sales to retail outlets probably includes sales to "authorised distributors" who deal exclusively with retail outlets that handle only the products of their major company supplier; this might be the case, for example, if the major company considers its "authorized distributors" as agencies for distributing its products to "100 per cent retail outlets".  

The jobber, in contrast to the distributor, "shops around" among the various refiners, buying from whichever supplier whose products and prices he believes will profit him most. The products purchased by the jobber from the suppliers may be of two kinds. He may purchase "unbranded" products which the refiner usually reserves for the jobber trade, or he may order from the refiner a product manufactured to his own specifications and bearing his own trade-name. The latter practice prevails where the jobber owns or leases a number of retail outlets which he operates as "chain" filling stations. An illustration of this type of jobber is "Billups" that operates chain filling stations throughout Louisiana and other Southern States.

112 These retail outlets that sell only the products of one supplier, usually a major company. Infra, "Retail Marketer", cf. Horton, Independent Petroleum Company, p. 533.
Jobbers, such as Billups, are "complete" marketers; they sell petroleum products under their own trade-names through controlled retail outlets. They advertise their products, supply retail outlets with pumps and other equipment bearing their trade-names, and set their own prices in accordance with the prevailing competitive conditions of the areas in which they operate.

The Retail Marketer

To the average American motorist and the general public, the local retail filling station is perhaps too readily identified with the familiar trade-names of "Esso", "Socony", "Texaco", etc., displayed by thousands of service stations along every highway and by-way. These advertising displays lend apparent credence to the oft-mistaken idea that the retail marketer is an employee of the major company whose products he advertises. Filling station employees often wear uniforms or caps purchased from and bearing the insignia or name of a major company which further tends to identify them as major company employees. Technically, at least, the opposite is the case; the majority of service and filling station operators are small, independent enterprisers.

The latest available data\textsuperscript{113} reported 241,858 filling

\textsuperscript{113} U. S. Census of Business, Vol. I, 'Retail Trade, Part I.
stations or primary outlets in the United States, in addition to which there are perhaps some 150,000 to 200,000 secondary retail outlets.\textsuperscript{114} Primary outlets gave full-time employment to 467,002 persons, and employed an additional 39,115 part-time and 99,534 family workers.\textsuperscript{115} It is apparent the small individually operated business dominates the retail marketing division. Of 230,460 "independents" reported (95.3 per cent of all filling stations), almost one-half (115,159) were operated by the proprietor only, and, in an additional 100,012 filling stations, the proprietor employed either one or two workers.\textsuperscript{116} Thus, with more than ninety per cent (214,171) of the independent stations employing less than four persons, including the proprietor, it is quite clear the small business unit is characteristic of the retail marketer.

\textsuperscript{114} Primary outlets as defined by the Census of Business are retail outlets with more than half of the dollar sales derived from petroleum products. Secondary outlets are retail stores such as garages, repair shops, motor vehicle dealers, accessory and tire dealers, country general stores, restaurants, and road-side stations which obtain more than half of their business from sources other than petroleum products. Petroleum Almanac, p. 108.

\textsuperscript{115} Appendix, Table 15.

\textsuperscript{116} Loc. cit.
In view of the involved leasing practices now currently in force throughout the retail marketing division, there are no reliable data available as to the number of owner-operated filling stations. A "spot" field survey was undertaken in April and May of 1939 of every garage and filling station in four large cities in widely separated parts of the country (Washington, D. C.; Columbus, Ohio; New Orleans, La.; and Portland, Oregon) to determine to what extent retail outlets were "controlled" or were "independent".  

Table A.
Summary of Ramsdall Study of Retail Operations in Four Major Cities, 1939

| Total Retail Outlets Surveyed | 2,434 | 100.0 |
| Owned and operated by major oil companies | 304 | 12.5 |
| Leased and operated by major oil companies | 16 | 0.6 |
| (Total owned, or leased and operated by majors)(320) (13.1) |
| Owned by major oil companies and leased to independents | 669 | 27.5 |
| Leased by major oil companies, re-leased to independents | 350 | 14.4 |
| Owned and operated by independents | 1,095 | 45.0 |

Stations selling gasoline of only one major company | 2,296 | 94.3 |
Stations selling motor oil of only one major company | 2,011 | 82.6 |
Stations advertising products of only one major company | 1,986 | 81.6 |

Source: TNEC (Part 15-A), pp. 8745-8746; Also, see Appendix, Table 16.

117 Arthur W. Ramsdall, sales and marketing consultant, conducted the study for four independent refiner-marketers. See TNEC (Part 15A). Appendix, Table 16.
Combining the results of this survey (see Table A) reveals that of 2,434 retail outlets visited, forty-five per cent (1,095) were independently owned and operated; forty per cent (973) were owned by major companies, of which 304 were operated by majors; and fifteen per cent (366) were leased by major companies, of which only 16 were operated by them. Excluding the outlets operated by the majors, eighty-seven per cent (2,114) were operated by independent proprietors. Whether or not this eighty-seven per cent, somewhat lower than the previously given Census figure of 95.3 per cent, and the results of a four-city survey can be deemed representative of the national retail market picture, the overwhelming majority of independent marketers in the retail field is a fact confirmed by both the Census and the Ramsdall survey.

There are, however, strong indications that questionable practices now current in the retail branch of the industry have had the effect of so restricting the operations of the independent retailer that he is "independent" only in the legal or technical sense of the term. Service station relationships with their suppliers, stated or implied by the terms of leases, frequently result in the independent retailer becoming a "100 per cent station".


119 See Appendix, Table 17, for a general survey of the numerous legal forms of service station relationships with their suppliers.
It is estimated, for example, that the ratio of "100 per cent stations" to "split stations" (those that dispense products of more than one company) is about nine to one.\textsuperscript{120}

The "100 per cent stations" are obtained by sundry and devious methods: split-account differentials, price differences based upon gallonage, secret rebates, leasing stations at low or inadequate rentals, granting courtesy card privileges only to "100 per cent stations", price wars, inducements of free equipment, paint jobs, construction, paving, and advertising displays, etc.\textsuperscript{121}

The attempt by the TNRC to ascertain to what extent "100 per cent stations" were prevalent throughout the industry as a restrictive measure to the independent operations of retail stations resulted in an incomplete return. Various interpretations were given by the majors to the word "exclusively" used in the questionnaire.\textsuperscript{122}

Returning to the Ramsdall four-city study (Table A), 41.9 per cent (1019) of all retail outlets were leased from

\textsuperscript{120} Horton, TNRC (Part 16), p. 9134.

\textsuperscript{121} Ibid., 9128-9147; Cf. Horton, Independent Petroleum Industry, pp. 532-537.

\textsuperscript{122} Question 23e asked for a tabulation for each year 1929 to 1938 inclusive of "the number of service stations leased to operators handling the supplies of the reporting company exclusively...", TNRC (Part 14), Exhibit No. 1137, "Questionnaire for Oil Companies," p. 7426.
major companies, which, if combined with the 320 stations operated by the majors, totals 1,339, or fifty-five per cent of all outlets. It might be reasonably expected that these stations would favor the products of their major supplier, but apparently the control of the majors extends beyond these types of retail outlets. It will be noted that ninety-four per cent (2,296) of the stations sold the gasoline of only one major company; eighty-three per cent (2,011) dispensed the motor oil of only one major; and eighty-two per cent (1,986) displayed or advertised the products of only one major company.

The Ramsdall study tends to support the report of the Federal Trade Commission submitted in 1946 to the Senate Committee investigating the problems of the independent company; that the policies and operations of the independent retail marketers and those of the independent jobber are practically, if not technically, under major company control.123

"By coercion, threat, and intimidation of cancellation of lease, the dealer is compelled to open his place of business at unprofitable hours in the early morning and remain open until unprofitable late evening hours.

"By threat, coercion, and intimidation of cancellation of lease, he is compelled to buy other than manufactured items of the supplier. The supplier is acting as a jobber for parts and accessories and compels the dealer to buy these parts and accessories from his leaseholder despite the fact that many times the dealer has to pay more for these items than he could buy them for from other sources.

"By threat, coercion, and intimidation of cancellation of lease, the supplier insists on increased gallonage sales without taking into consideration strikes stopping deliveries from the supplier's place of business, fewer people driving, particularly defense plant workers because of war reconversion adjustment.

"The supplier and issuer of the lease also is creating competition among his own trade by opening up every source of distribution including dilapidated places that have been closed for years, also taking away from a successful dealer the dealer's fleet accounts by supplying these accounts, whom the dealer has built up, at the dealer's net costs, and in some instances, better than what the dealer gets.

"The supplier is, and there is no other category that you can place him in, but the status of his actually being an employer, with the employee furnishing the money to operate a place of business called a gasoline station. It is my opinion that by some phony manipulation or interpretation of the law, the supplier does this to evade the full responsibilities in operating an individual gasoline station. These responsibilities are bookkeeping of taxes to the Treasury Department, bookkeeping of taxes due the State Treasury departments, bookkeeping of social-security collections and unemployment benefits, and bookkeeping of lawsuits that might arise out of accidents in the gasoline station."

The Cooperative

Although the petroleum business of the cooperative movement only recently has become recognized as an important segment of the petroleum industry, it has grown, since 1937, into the "largest single independent petroleum operator in the country, and the American cooperative movement has its

124 Ibid., p. 536.
second greatest strength in the petroleum industry." 125 This is rather interesting in view of the fact that the cooperative movement in the United States has usually been thought of in terms of its farm marketing and purchasing activities. 126

It is not intended here to go into the history of the cooperatives, but simply to bring attention to the importance assumed by them in the petroleum industry. Cooperatives are engaged in many fields of business, and the membership of their various associations is numbered in the millions. 127

Beginning with a single service station organized at Cottonwood, Minnesota in 1921, 128 the petroleum activities of the cooperatives were not very extensively expanded until after 1937. Since 1937 the petroleum cooperatives have made remarkable growth. In 1937, there was not a single oil well, pipe line, or refinery owned by the cooperatives. Today, six years later, there are, in the United States, 9 gasoline refineries, 1 lubricating oil refinery, nearly 300 producing oil wells, more than 1,000 miles of pipe line, all owned by cooperatives." 129 The petroleum cooperative is particularly

127 Fell, Independent Petroleum Company, p. 325.
strong throughout the Middle West; for example, in 1939, they handled "10.6 per cent of all gasoline, kerosene, and other refined light oils brought into Minnesota."  

One of the largest cooperatives engaged in petroleum activities is the Consumers Cooperative Association of North Kansas City, Missouri, which, in 1943, is reported to have had petroleum sales of more than $12,000,000, and "the value of cooperative trade (of all cooperatives) has passed $250,000,000 annually."  

The growth of the cooperative movement in the petroleum industry, although entirely outside the control of the major companies, nevertheless is viewed as a distinct threat to the independent company. Appearing before the Special Senate Committee Investigating Petroleum Resources in March of 1946, the president of the Independent Petroleum Association of America presented the following testimony:

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131 Independent Petroleum Company, pp. 325, 505.

132 "Coops Reach $250,000,000 Level in Oil Industry", ESPA (magazine of the Empire State Petroleum Association, May 1945, p. 10) in Independent Petroleum Company, 505.
"The important thing, Mr. Chairman, from our point of view as an independent company is, it (the cooperative) is driving out independents from business... So something has to be done to prevent this thing, for they are going out and buying properties and concentrating through these groups their efforts at producing, transportation, marketing, and refining. It is becoming a distinct threat to this industry... I think it is a definite trend in the wrong direction and will eventually break up the American way of life, the American institution of private enterprise... It is not the American way of doing business."133

The complaints of those who voiced concern with the rapid growth of the cooperative movement in the petroleum industry were not directed at the legality of the movement, but rather that tax-free cooperatives enjoyed a competitive advantage over business organizations that were not tax-exempt.134

Other Independents

The modern petroleum industry, largely due to the influence of technology, has become highly specialized compared to the industry of earlier days, or even as contrasted with the industry of a quarter of a century ago.

Illustrative of the vast changes that have taken place is the production branch of the industry. In former days, all the operations connected with drilling a well, for example, were usually done by one enterpriser, the independent oil-producer. He made the decisions where to locate the well, and how deep to drill it; he supervised

133 B. A. Hardy, Independent Petroleum Company, p. 10.
134 Independent Petroleum Company, p. 517.
the clearing of the well site, the hauling of lumber and
field equipment, the building of the derrick, the digging
of slush pits, providing the water supply, etc. The in-
dependent producer hired his own drilling crew and vested
the responsibility of drilling operations with the driller.

Today, new techniques and technological improvements
have broken down the drilling operations into a series of
specialized functions that are now performed by a number
of individuals and companies.

To what extent "specialized" companies and technical
and professional specialists have entered the production
branch, it is almost impossible to say. Since 1930, there
has been a trend toward contracting various phases of the
drilling operations, and the 1939 Census,\textsuperscript{135} for the first
time, gives some indication of the extent to which contract-
ors are now used. It lists seventeen types of production
contractors embracing 1,888 concerns and employing 46,939
persons.\textsuperscript{136} These contractors usually specialize in one
type of operation: drilling, exploration, rig building,
oil well cementing, or similar services. Undoubtedly other
branches of the industry have also made use of these or

\textsuperscript{135} Census of Mineral Industries, 1939, Vol. I,
Table 22, p. 174.

\textsuperscript{136} Appendix, Table 29.
similar "specialty" concerns, but there are no reliable data that give the size or the number of such concerns. Such business enterprises are generally classified in the Census according to their functions. For example, consultant geologists and other independent technical specialists would be classified in the industry division, "professional and semi-professional workers"; trucking concerns that haul heavy oil-field equipment would probably be classified in the "transportation" industry, and general contractors who prepare the oil-well site for drilling operations may be found in the "construction" division.

Even were it possible to identify those concerns whose principal operations were associated with the petroleum industry, it still would be rather difficult to determine whether they were "independent" companies. Without additional information concerning the financial control of stock ownership, it would be almost impossible to ascertain to what extent these concerns were directly or indirectly controlled by the major integrated oil corporations.

From out of this involved picture of the economic structure there emerge two unique features of the business organization of the petroleum industry: its operations are integrated to a high degree, and it is controlled principally by large-sized business.

Predominantly the oil industry is composed of a few
very large corporations each of which does a substantial percentage of the aggregate petroleum business, and each of which is fully-integrated from the oil well to the retail filling station.

Although the major integrated companies are the dominant factors in all branches of the industry, there are also numerous smaller enterprises. Individually, these so-called independent companies have a very small share in the total volume of the petroleum business, but, collectively, they apparently represent a substantial percentage in the crude petroleum production and retail marketing branches. However, the practices and policies of the major companies have resulted in the smaller companies bearing a disproportionate share of the risks inherent to the operations of these branches of the industry.

It is evident from this brief analysis of the economic structure of the petroleum industry, that control of the industry has been possible largely because of the high degree of concentration among a few proprietary interests. When operations are carried on among thousands of distinct and widely scattered small business units as in the production of crude petroleum and the marketing of refined products, instability and many inequalities result from the conflicting policies of the numerous units and from their inferior financial position.
PART XIV

THE PETROLEUM INDUSTRY LABOR FORCE
"Any economic system or process of making a living is a part or aspect of the organic life of the individuals or groups involved. It is not a separate mechanism or arrangement designed or constructed by anybody to supply a group of people called consumers with goods or services, or to distribute to a group called employees amounts of moneys called wages or salaries, or to provide a group called investors with dividends or interest checks, or to pay taxes to a group called government officials. Neither such a mechanism, nor these groups of people exist at all..."

"People, individual human persons, are the only things there are in any economic system and in any political system. Apart from them, there is no such thing as 'business', or 'government', or even 'society'."

Thus far this study has traced the societal and technological changes that have immeasurably influenced the economic or physical structure of the petroleum industry. Quite clearly the industry has been sensitive, and has responded to these influences. It has reorganized and adjusted its

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technological and financial organizations in order to increase economic efficiency: to produce a greater quantity and quality of goods at reduced unit costs. The extent and manner of developmental growth of the economic structure in the petroleum industry has important sociological significance.

The tremendous size of the petroleum industry, measured by its capital assets, and its pattern of economic organization as represented by its complex vertical integration are not atypical of modern American industry. Similar developments obtain, for example, in the transportation equipment, chemical, and iron and steel industries. Under the guidance of modern technology and finance capitalism, the petroleum industry now ranks as the fourth largest manufacturing industry in the United States with respect to its value of products, out-ranked only by motor vehicles, steel and rolling mills, and meat-packing industries. This refers only to the refining branch of the industry which accounts for but one-fourth of the petroleum industry investment.

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2 TNEC (Final Report), p. 41.
3 Appendix, Table 18.
4 Appendix, Table 6.
The growing interdependence between the Community and the giant, multi-million dollar corporations of modern American business represents a relationship in which, if it is at all possible to do so, it is difficult to demarcate clearly and definitely where industry stops and the Community begins. But industry, or business, a cultural product created and developed as a medium by which the economic activity of earning a living can be carried on, does not represent only innovations in machine techniques of production, nor simply the rise of vast, complicated and financially controlled economic institutions. Neither are its forms or functions explainable solely in terms of classical economic theories. Economic activity and its formal institutions derive from, and must be understood as dynamic social relationships. These relationships are never static; they vary and change continuously as the human factor -- owner, management, and worker -- is compelled to adjust to technological and societal changes both within and outside of the physical environment of the industrial plant or place of business.

It is within the structural framework of economic institutions that a growing proportion of the society is called

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5 Arensberg, Conrad M. "Industry and the Community", American Journal of Sociology, XLVIII (July 1942)

6 In 1947, approximately 43 per cent of the United States population was employed, compared with 38 per cent in 1900; an increase of 12 per cent. See Appendix, Table 19.
upon to make these adjustments: a complex process involving workers and machines, workers and their fellow workers, and workers and their employers. In the same way that impersonal or non-human factors of money, plants, and equipment have been carefully studied and minutely organized to achieve the greatest possible efficiency and economy, the technical division of labor,\(^7\) likewise, has not escaped the attention of the industrial "efficiency expert". It is the manner in which men and machines are effectively organized for economic efficiency, and the system of human relationships that develops from this continuous social process of human adjustment to modern technological changes that are, in the final analysis, the very basis of industrial social organization.

The inclusion and consideration of the human factor in the structural framework imparts sociological significance to the industrial organization, for the social interaction arising from human relationships within the environmental conditions of modern industrial organization implies that "industrial relations" must be translated into "human relations" if there is to be an adequate understanding of economic behavior as a social phenomenon in contemporary industrialized society.

Having already described and discussed the technological and societal changes and their relationship to the

resultant economic structure, the description of the social structure of the petroleum industrial organization still is incomplete. A description of the human factor, or labor force, is now pertinent in order to complete the picture, and to make the social organization sociologically meaningful.

However, before these industrial, or social relations can be studied and interpreted sociologically, it will be necessary to know something about the labor force: how large is it, how is it distributed regionally and occupationally, and what is its composition with respect to such socially relevant factors as sex, race and age.

In order to relate the following discussion of the Labor Force to the later section on Industrial Relations, the present chapter will analyse the characteristics of the labor force as to its size, distribution and composition; and another chapter will be devoted more specifically to some of the more important occupations in the petroleum industry.

**Limitation of Factual Data**

One of the most disturbing things about the petroleum industry labor force data is the lack of any complete and accurate information concerning either the present or the past volume of employment. For some branches of the

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industry, reasonably accurate data are reported; in other branches, the data are deficient, are on widely varying bases, or they are non-existent.

An exhaustive search of all pertinent census reports since 1860 was made in an attempt to provide a reliable historical picture of employment in the industry, but such reports were very inadequate and incomplete. A similar attempt was made by the Works Progress Administration in 1935, but the results of that study involved a number of estimated calculations, and, even then, it was found that "data are inadequate for compilation of a long-time statistical series on over-all employment covering every department of the oil and gas industry..."

It is unfortunate that the integrated character of the petroleum industry structure does not permit a more accurate accounting of its employed labor force. Since the activities of the industry come under the jurisdiction of several Federal agencies, differences among the various

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10 Ibid., p. 17, and Table A-2, p. 317.

11 The production branch is reported by the Bureau of Mines, the Bureau of the Census reports on refining (Census of Manufactures), marketing (Census of Wholesale and Retail Trade), production (Census of Mineral Industries), and, in more or less detail, but not consistently, on all of these branches in the Census of Population; Labor Force. The Interstate Commerce Commission reports on pipe-line and marine transportation for interstate carriers, and the Bureau of Labor Statistics issues from time to time, but not regularly, special studies on the activities of the production and refining branches.
systems of reporting are difficult to reconcile.

"The production branch is incompletely covered by the Bureau of Labor Statistics monthly reports on employment and pay-rolls...and by recent annual reports of the Bureau of Mines on employment and productivity...The BLS figures have but little quantitative value though they reflect recent trends in identical establishments, while the Bureau of Mines figures, which cover only the years 1935, 1936, and 1937, definitely exclude contract workers and are indefinite as to their coverage of salaried employees -- particularly those not actually 'in the oil fields'.

"The refining branch is covered by BLS monthly reports and by the bi-annual surveys of the Bureau of the Census; however, the latter definitely exclude salaried employees, and the BLS figures do not include all of them.

"The Interstate Commerce Commission, since 1921, has issued reports annually on employment and payrolls in pipe-line transportation, but includes only the interstate carriers.

"The wholesale and retail marketing branches were surveyed by the Bureau of the Census during 1933 and 1935, but gave up a similar survey in 1937 because of the difficulties encountered. Even the earlier reports excluded the earnings of all retail filling-station proprietors -- 18,000 in 1935 -- most of whom were full-time workers."12

A description and analysis of the labor force for the petroleum industry as a whole, therefore, can only be attempted within restricted limitations.

Size of Labor Force

Perhaps the best estimate as to the size of the petroleum industry labor force -- approximately one million workers -- is more of an understatement than an exaggeration. Despite the above-mentioned inconsistencies of the several reporting agencies from which data are available, this study has prepared a basic table,\textsuperscript{13} which is summarized in Table \textbf{B.}, as to the approximate size of the labor force in 1938, and its distribution among the various activities of the industry. The total of 1,008,848 undoubtedly excludes those individuals who are associated with the industry in a professional capacity, such as consulting geologists and petroleum engineers. It is also doubtful whether the employees of contracting concerns, for example, those engaged in hauling oil-field equipment, or the employees of establishments that sell petroleum products as an adjunct to another mode of business are included in the above total.

\textsuperscript{14} Fanning,\textsuperscript{14} in his estimate published in 1945, has

\begin{itemize}
\item \textsuperscript{13} Appendix, Table 20.
\item \textsuperscript{14} Our Oil Resources, Table 13, p. 306.
\end{itemize}
attempted to make allowances for certain of these discrepancies, and he arrives at a total employment figure for the industry of 1,124,340 in 1939. He has tried "to correlate the known data with estimates (some of which are only informed guesses) to show employment for the entire industry. Gathering of accurate data is complicated by the year-to-year changes in the proportion of work done by producers themselves and by contractors, the difficulty of obtaining any reliable data on contract work, and by the non-uniformity of classifications used by the several agencies which compile these figures. Automotive-transportation workers (mostly truck drivers) are included with the industry division in which they work (by the Bureau of Census); quite probably, well over 100,000 truck drivers are employed throughout the industry." In his estimates, Fanning has included 150,000 "workers engaged in the sale of petroleum products at secondary outlets", and 65,000 "central office employees not segregated by branches of the industry".

From the data presented in Table B., it is at once evident that the employees of the petroleum industry are peculiarly distributed with respect to the various branches of the industry. Of the more than one million workers, approx-

15 Loc. cit.
16 Loc. cit.
Approximately seventy per cent are engaged in the marketing of petroleum products. The production branch, which includes drilling operations, provides employment for eighteen per cent of the labor force; pipe-line and marine transportation, accounting for only three per cent, has the smallest percentage of workers; while the refining, or manufacturing branch, has slightly less than ten per cent of the employees.

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**TABLE B.**

**TOTAL LABOR FORCE OF THE PETROLEUM INDUSTRY BY BRANCH OF INDUSTRY, AND NUMBER OF CONCERNS, 1939.**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Production</th>
<th>Trans-</th>
<th>Refin-</th>
<th>Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns</td>
<td>28,723</td>
<td>8,984</td>
<td>63</td>
<td>485</td>
<td>274,181</td>
</tr>
<tr>
<td>Total Employed</td>
<td>1,008,848</td>
<td>177,592</td>
<td>32,741</td>
<td>98,568</td>
<td>699,947</td>
</tr>
<tr>
<td>Excl. Marketing</td>
<td>308,901</td>
<td>177,592</td>
<td>32,741</td>
<td>98,568</td>
<td>--</td>
</tr>
</tbody>
</table>

**Percentage Distribution**

<table>
<thead>
<tr>
<th></th>
<th>Concerns</th>
<th>Total Employed</th>
<th>Total Employed</th>
<th>Excl. Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total Employed</td>
<td>100.0</td>
<td>17.6</td>
<td>3.2</td>
<td>31.9</td>
</tr>
<tr>
<td>Excl. Marketing</td>
<td>100.0</td>
<td>57.5</td>
<td>10.6</td>
<td>--</td>
</tr>
</tbody>
</table>

Source: Appendix, Table 20.

The high concentration of workers engaged in marketing activities obviously has tended to distort the picture of the "traditional" oil industry. A more realistic picture,
perhaps, obtains when the marketing branch, comprised mostly of individual enterprisers, is excluded. The results of such a procedure indicate more than half of the 308,901 workers employed in the other three branches are in production, slightly less than one-third are in refining, and one-tenth are in transportation.

Comparatively, the various branches of the petroleum industry are a relatively small proportion of the major industry groups under which they are classified by the Census. Petroleum refining represents but 1.7 per cent of all manufacturing industries, and ranks fifteenth of the seventeen manufacturing industries listed by the Census; of the four mining industries, petroleum production is second behind coal mining with 20.2 per cent of the workers; in transportation, the pipe-lines rank last among the seven industries, representing only 0.8 per cent of the transportation workers; and in retail trade, filling stations are ranked sixth among the ten retail divisions, with 6.4 per cent of retail trade workers.

Regional Distribution

Unfortunately, the census data from which Table C. and the following statistical tables of this chapter were

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17 Petroleum refining is classified as manufacturing, petroleum production as mining, pipe-lines as transportation, and filling stations as retail trade. See Appendix, Table 28.
compiled, are incomplete since they do not make available
the figures for the petroleum wholesale trade, nor for
marine transportation.

<table>
<thead>
<tr>
<th>Regions</th>
<th>Total</th>
<th>Production</th>
<th>Refining</th>
<th>Pipe-line</th>
<th>Filling Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>787,278</td>
<td>183,619</td>
<td>178,019</td>
<td>17,536</td>
<td>408,104</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Northeastern</td>
<td>18.0</td>
<td>6.9</td>
<td>28.6</td>
<td>5.6</td>
<td>19.0</td>
</tr>
<tr>
<td>North Central</td>
<td>27.1</td>
<td>15.9</td>
<td>21.3</td>
<td>29.7</td>
<td>34.6</td>
</tr>
<tr>
<td>Southern</td>
<td>40.3</td>
<td>60.4</td>
<td>35.9</td>
<td>58.5</td>
<td>32.4</td>
</tr>
<tr>
<td>Western</td>
<td>14.6</td>
<td>16.8</td>
<td>14.2</td>
<td>6.2</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>23.3</td>
<td>22.6</td>
<td>2.3</td>
<td>51.8</td>
</tr>
<tr>
<td>Northeastern</td>
<td>100.0</td>
<td>9.0</td>
<td>35.8</td>
<td>0.6</td>
<td>54.6</td>
</tr>
<tr>
<td>North Central</td>
<td>100.0</td>
<td>13.7</td>
<td>17.8</td>
<td>2.4</td>
<td>66.1</td>
</tr>
<tr>
<td>Southern</td>
<td>100.0</td>
<td>35.0</td>
<td>20.2</td>
<td>3.2</td>
<td>41.6</td>
</tr>
<tr>
<td>Western</td>
<td>100.0</td>
<td>26.9</td>
<td>22.1</td>
<td>0.9</td>
<td>50.1</td>
</tr>
</tbody>
</table>

Source: Appendix, Table 21.

The Petroleum Almanac (p. 187) reported 98,460 wholesale employees, distributed by States, for 1939; when combined into regions similar to the census data, the results are as follows: Northeastern, 25,663; North Central, 31,409; Southern, 25,993; and Western, 25,575.

It should also be noted that the labor force volumes of the 16th Census of United States Population, 1940 report 178,019 employees in the refining branch (See Appendix, Table 21), as compared with only 98,568 reported by the Census of Manufactures, 1939 (Cf. Appendix, Table 20). It is very probable the Census of Population includes central office employees of integrated companies primarily engaged in refining; whereas, the Census of Manufactures excludes such workers. This is one of those cases that illustrates the widely varying results because of different bases upon which censuses are taken.
A rather interesting and significant fact obtains from Table C; namely, the large proportion of the petroleum workers in the South. More workers are employed in the Southern region than are employed in the combined Northeastern and Western regions. With but one exception -- in the North Central region where more workers are employed in filling stations -- the Southern region has the greatest proportion of employees in all branches of the industry.

The large percentage of petroleum production workers in the South is due, of course, to the number of large oil fields, while the pipe-lines are important in this region because of the Gulf and South Atlantic ports to which crude oil is transported by pipe-line for shipment by tank-ship to northern refineries, and also because oil is transported by pipe-line to the refineries now located in the Southern region. It will be noted that refining, once centered in the Northern States, now has the largest proportion of its employees in the South.

The prominence of the filling station workers is evident in all regions; every region except the Southern (41.6%)

19 See Appendix, Table 2, for leading oil-producing States in 1944.

20 "In 1937 the computed center of the refining industry was northeastern Oklahoma, not far from the center of crude-oil production; in 1900, by contrast, the center of the refining industry was in central Illinois." O. E. Keissling, et al., op. cit., "Migration to Flush Areas", p. 37.
has fifty per cent or more of its petroleum workers engaged in retail marketing, with the largest concentration shown in the North Central region where two-thirds of the workers are found in the filling stations.

Except for filling stations, petroleum production is the more important source of employment in the Southern and Western regions, while in the Northeastern region refining provides the greatest employment.

The large concentration of petroleum employees in the Southern region are for the most part in the States of Texas, Louisiana, Oklahoma and Arkansas, and more recently but not yet in very large numbers in Mississippi. This large number of workers of the highly technical petroleum industry in a regional setting essentially rural in character implies that industrial relations of a large segment of the industry will be influenced by Southern ideologies and institutions: the traditional opposition of the South to labor unions, and its defense of "States' rights" and "White supremacy".

Sex and Color Composition

Another important social fact having a direct bearing

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21 16th Census of Population (Vol. III), Labor Force, Part I, U.S. Summary, Table 74, p. 181; See also, Appendix, Tables 2 and 3, for leading oil-producing and refining States for 1944 and 1945.
upon the social organization and industrial relations of
the petroleum industry pertains to the proportions of fe-
male and non-white workers in the labor force. The per-
centage distribution of these social groups of workers is
presented in Table D, for the various branches of the
industry.

In the absence of reliable historical data, it is
difficult to establish causal relationships between the
character of the petroleum industry and the composition of
its labor force with regard to sex and color. It is probably
a "safe" assumption that the migratory nature of the produc-
tion branch with its demand for workers who have the stamina
and physical endurance to withstand the rigorous discomforts
of out-of-door work in all kinds of weather, who are able
to handle the heavy field equipment, and who are willing to
work and live in isolated areas amidst inadequate and even
unpleasant surroundings, has certainly had few attractions
for the female worker. The work in the oil fields is dirty
and hard, and not all of the work associated with drilling
oil wells requires skilled labor; yet there are almost no
non-white workers (0.6%) found in the oil fields, even among
the "roustabouts", or common laborers.
Drilling operations are very expensive. Any delay because of discord among the workers only adds to the expense; therefore, cooperation is essential among all members of the drilling crew, from the "roustabout" to the "tool pusher" (drilling supervisor of several well operations). Not only must they work together as a closely coordinated team, they frequently must live together especially when, as is often the case, the drilling operations are located in isolated areas.
Plate XIII

Esso-Standard Refinery at Quitting Time

Note the number of Negro workers, hard helmets, and bicycles. The company furnishes bicycles for travel about the vast plant and provides the helmets for protection from falling objects.

Photo by Rosskam
These factors may partially explain the absence of non-white workers in an industry labor force which tends to be concentrated in the South, although this region has a large Negro population. Whether or not the conditions of oil field employment have established traditions against hiring non-white workers which have been carried over into the other branches can only be speculated, but, singularly enough, it is characteristic of all branches of the industry, that the petroleum industry labor force is predominantly composed of White male workers.

In each branch of the industry, no less than ninety-two per cent of the workers are males. The lowest percentage is in the refining branch where the greatest percentage (7.4%) of females find employment. The largest concentration of males is found in the pipe-line branch (98.0%), with production next (97.2%), then filling stations (96.7%).

The White workers likewise dominate every branch. Their percentages range from 94.3 per cent in the filling stations, to 99.4 per cent in production; refining has 97.0 per cent, and they constitute 96.1 per cent of the pipe-line branch. Non-whites comprise only about four per cent of all workers, with their largest concentrations in the filling stations (5.7%) and in the pipe-line branch (3.8%).

Since White workers so completely dominate the industry in every branch, their distribution with regard to sex is almost identical with that already given for the entire
industry. Among the Non-whites, the concentration of male workers is even greater than among the White workers, almost ninety-nine per cent.

As would be expected, the greatest percentage of workers, both for male and female and for White and Non-white are found in the marketing, or filling station branch. More than half of the White males are employed by filling stations, less than three per cent in the pipe-line branch, and the remainder are about equally divided between the production and refining branches.

White females, who constitute four per cent of the labor force, find their principal source of employment either in filling stations or in refineries, with about forty per cent employed in each of these branches, and about one-sixth in the production branch.

There are very few Non-white females (438) employed by the industry. The Non-white males comprise about four per cent of the petroleum industry labor force, and three-fourths are employed in filling stations, with the refining branch providing employment for eighteen per cent.

Age Distribution

Limiting the analysis of age distributions of the labor force to the male workers who are so characteristic of the petroleum industry, there are presented in Table E. the age distributions of these employed workers.

It is interesting to note the close similarity of
the age distributions in the production and refining branches, despite the fact that the functions and occupations of the two branches are quite varied and distinct from one another. In each branch, almost two-thirds of the male workers are concentrated in two age groups: 25-34, and 35-44, and their median ages are about the same: 37.5, for petroleum production, and 37.7, for the refinery workers. Each branch has approximately nine per cent of its workers between the ages of fourteen and twenty-four, and about one-fourth of the workers in each branch are over forty-four years of age.

The filling station personnel, on the other hand, present a very different age distribution. Compared with the production and refining branches, workers in the filling stations tend to be much younger: more than three times as many are between the ages of 14 and 24 than in the other two branches. This is reflected in the median age of 31.4 for the filling station branch. More than one-half of filling station workers are between 25 and 44 years of age, with more than one-third of them in the modal group 25-34.

Although it is not possible to make an exhaustive analysis from the limited data available, certain generalizations seem implied from the differences in the age distributions of the petroleum industry branches when compared with the major industry divisions into which the branches are grouped in the Census: mining, manufacturing, and retail trade.

In the following analysis of employed male workers, petroleum
production is compared with mining, refining with manufacturing, and filling stations with retail trade; petroleum workers are excluded from the comparable industry groups.

**TABLE E.**

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Petroleum Production</th>
<th>Mining</th>
<th>Refining</th>
<th>Manufacturing</th>
<th>Filling Stations</th>
<th>Retail Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-19</td>
<td>178,522</td>
<td>723,539</td>
<td>164,794</td>
<td>8,085,796</td>
<td>394,440</td>
<td>4,089,874</td>
</tr>
<tr>
<td>20-24</td>
<td>2.6</td>
<td>12.4</td>
<td>8.5</td>
<td>14.0</td>
<td>20.1</td>
<td>12.8</td>
</tr>
<tr>
<td>25-34</td>
<td>32.4</td>
<td>29.1</td>
<td>32.2</td>
<td>30.0</td>
<td>35.0</td>
<td>26.5</td>
</tr>
<tr>
<td>35-44</td>
<td>30.9</td>
<td>23.9</td>
<td>30.6</td>
<td>22.9</td>
<td>19.9</td>
<td>22.7</td>
</tr>
<tr>
<td>45-54</td>
<td>18.2</td>
<td>19.7</td>
<td>19.2</td>
<td>17.6</td>
<td>10.3</td>
<td>18.2</td>
</tr>
<tr>
<td>55-64</td>
<td>7.3</td>
<td>10.0</td>
<td>7.5</td>
<td>3.9</td>
<td>5.5</td>
<td>10.2</td>
</tr>
<tr>
<td>65 and over</td>
<td>1.4</td>
<td>2.3</td>
<td>1.0</td>
<td>2.8</td>
<td>2.4</td>
<td>4.1</td>
</tr>
<tr>
<td>Median Age</td>
<td>37.5</td>
<td>37.5</td>
<td>37.7</td>
<td>36.0</td>
<td>31.4</td>
<td>36.9</td>
</tr>
</tbody>
</table>

*Data for pipe-line branch not available.

**Comparable industry groups exclude petroleum workers; petroleum production is compared with mining, refining with manufacturing, and filling stations with retail trade.

Source: Appendix, Tables 23 and 24.

In the petroleum production branch, compared with mining, there are fewer male workers 14-24 years of age, a larger proportion in the age groups 25-34 and 35-44, and fewer in the groups above 45 years of age. For the mining industry, composed largely of coal miners, the larger percentages of younger workers may result from the fact that
FIGURE 2.

COMPARISON OF AGE DISTRIBUTION OF MALE EMPLOYED WORKERS IN PETROLEUM INDUSTRY BRANCHES WITH MINING, MANUFACTURING AND RETAIL TRADE INDUSTRY DIVISIONS, 1940

SOURCE: TABLE 6.
workers are recruited from mining communities in which families are solely dependent upon the coal industry for employment. That boys tend to follow their fathers into coal mining at an early age is indicated by the 2.2 per cent of miners 18 and 19 years old, compared with only 0.8 per cent for the petroleum production workers. It is quite probable that the migratory characteristic of the drilling operations in petroleum production, which requires men capable of doing rigorous outdoor work and who are free to move about with the industry unfettered by family ties, may account for the high proportion of workers in the 25-34 year age group, while the high proportion in the 35-44 age group undoubtedly includes many workers in the more stable work in oil fields where a number of producing wells have been completed. Since older coal miners probably will remain in the coal mining community and will work as long as they are able, this would tend to increase their proportions in the older age groups as compared with petroleum production.

Compared with other manufacturing in the United States, the refining branch has a smaller percentage of male workers in the younger age groups 14-25, and in the older groups above

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22 Appendix, Table 24.
55 years of age; it has a rather large proportion, eighty-two per cent, of workers between the ages 25-54, compared with seventy-one per cent for manufacturing. There are several factors that may be associated with these differences in the age distributions: the large proportion of male refinery workers, the highly developed technology, and the relative newness of modern petroleum refining, which developed so rapidly during the past twenty-five years.

In petroleum refining, more than nine-tenths of the workers are males, compared with the little more than three-fourths in other manufacturing industries. This probably indicates, because of the highly technical character of petroleum refining work, that refineries are less likely to offer employment opportunities for females and young inexperienced workers than, for example, such manufacturing industries as tobacco, apparel, and logging. In the tobacco and apparel industries, more than one-half of the workers are females employed in relatively unskilled operations; while in logging, where ninety-nine per cent are male workers, and three-fourths are laborers, there is a large percentage of young workers: eleven per cent are between 14-19, and one-fourth are less than 25 years of age.

24 Ibid., Tables 81, 83, pp. 221, 245.
Plate XIV

Esso–Standard Refinery Workers
Baton Rouge, Louisiana

Photo by Rosskam
According to Mr. William Welden, assistant employment manager at the large Standard Oil refinery in Baton Rouge, Louisiana, the labor turnover of refinery workers is comparatively small, and tenures of twenty and thirty years are not unusual. These facts might imply, then, that refinery workers would be proportionately older than for other manufacturing industries; however, since modern petroleum refining is relatively young, workers entering the refinery at the age of 20 would still be less than 60 years old. An interesting comparison is graphically presented in Figure 3, between the refinery workers of 1930 and 1940.

In 1930, the Census reported 163,458 male refinery workers, and, in 1940, 164,794. A comparison of the age distributions of these workers shows, in 1930, there were almost twice as many workers 14 to 24 years of age as there were in 1940. The modal group, in 1930, was the 25-34 year age group; whereas, in 1940, there are bi-modal groups: the 25-34 and 35-44 year age groups. One-fourth of the workers, in 1940, were 45 years of age and older which is a rather significant increase over the twenty per cent for 1930. Thus, it would appear, if present employment practices should continue, that the percentage of workers in the older groups will


26 Statistics, Gainful Workers by Industry and Occupation, Table 1, pp. 6-7, (Reprint of Ch. 7, Vol. V.).
FIGURE 3.

COMPARISON OF AGE DISTRIBUTION OF MALE EMPLOYED WORKERS IN PETROLEUM REFINING, 1930 AND 1940

SOURCE: APPENDIX, TABLE 25.
probably increase until such time as those who reach a retirement age, say of 65, will be replaced by workers in the younger age groups.

There are also marked differences between the age distributions of filling station male personnel and other retail workers. In the filling stations, the largest concentration is in the groups below 45 years of age: 62.8 per cent are in these age groups which is in sharp contrast to the 44.8 per cent for retail trade. In each of the age groups above 45, the filling station branch has smaller percentages than other retail businesses. Several factors may be partially responsible for these differences. Filling station work, such as selling gas, can easily be done by young, inexperienced workers, and the unusually long hours that filling stations are opened would require younger persons able to work ten or twelve hours a day. The more regular hours of other retail stores, and the large number of individually owned and operated businesses throughout the country undoubtedly are factors that influence the larger percentage of older persons in retail stores, compared with the filling stations. It is also possible that the 99,534

27 Over 20 per cent of filling station personnel worked more than 70 hours a week in 1940; no other industry group in the United States approached that percentage. Labor Force, U. S. Summary, Table 87, p. 271.
family workers in filling stations, about 18 per cent of the total workers, may include a number of young people; this would tend to accentuate the percentage of filling station personnel in the lower age groups.

Residence

The selected data presented in Table F. show the urban, rural, non-farm, and rural farm residences of male petroleum workers in the production and refining branches, by region. Data for the production branch includes workers from 17 States and represents 99.2 per cent of all production workers. Although the Census does not report separately the residences for petroleum refinery workers, but combines them with the workers of "coal products plants", the latter comprise only 12 per cent of the total "petroleum and coal products" workers. The percentages in Table F. are based upon 177,872 male workers representing approximately 156,883 refining workers (about 95 per cent of all refinery employees) and 20,989 coal products workers from 20 States.

That the refineries tend to locate in or near urban consumer-market centers is indicated by the fact that almost three-fourths of the refinery workers live in urban areas, and that the majority of the others (23.3% rural non-farm) probably live within commuting distance of the refinery. In

28 Appendix, Table 20.
the Southern region, it will be noted that only a little more than half of the workers live in urban areas; however, this may be due to the location of the refinery in the "suburban fringe" of urban areas. For example, one of the largest refineries in the United States is located outside of the corporate limits of Baton Rouge, Louisiana. Data for Louisiana reveal the refinery workers are about equally divided between the urban and rural non-farm areas. When present plans for incorporating surrounding territory into the city limits of Baton Rouge are completed, a large proportion of the workers now living in rural non-farm areas will become urban residents. This will increase the percentage of urban refinery workers to about 85% for Louisiana, and will change the urban proportion for the Southern region from 58.5 per cent to about 63 per cent.

The location of the oil-fields, of course, is an important factor influencing the residence of petroleum production workers. This is indicated by the different pattern of the production workers as compared with that of the refinery workers: 42.1 per cent of the petroleum production workers live in urban areas and 46.0 per cent in rural non-farm areas, compared with 72.7 per cent and 23.3 per cent respectively for the refinery workers.

29 Appendix, Table 26.
Plate XV

Oil Field Transportation and Field Storage Tanks

Motor driven "Bateau" returning from oil field by way of a canal that serves as a highway during extremely muddy weather.

Choctaw Oil Field, Louisiana

Photo by Rosskam
<table>
<thead>
<tr>
<th>Residence</th>
<th>Total</th>
<th>North-Eastern</th>
<th>North Central</th>
<th>Southern</th>
<th>Western</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Production</td>
<td>177,148</td>
<td>12,447</td>
<td>28,149</td>
<td>105,606</td>
<td>30,946</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Urban</td>
<td>42.1</td>
<td>22.2</td>
<td>40.6</td>
<td>42.1</td>
<td>51.2</td>
</tr>
<tr>
<td>Rural Non-farm</td>
<td>46.0</td>
<td>61.0</td>
<td>40.4</td>
<td>45.8</td>
<td>45.6</td>
</tr>
<tr>
<td>Rural Farm</td>
<td>11.9</td>
<td>16.8</td>
<td>19.0</td>
<td>12.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Total Refining</td>
<td>177,872</td>
<td>53,300</td>
<td>41,193</td>
<td>61,654</td>
<td>21,725</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Urban</td>
<td>72.7</td>
<td>83.7</td>
<td>78.3</td>
<td>58.5</td>
<td>75.2</td>
</tr>
<tr>
<td>Rural Non-farm</td>
<td>23.3</td>
<td>14.7</td>
<td>17.9</td>
<td>34.6</td>
<td>23.0</td>
</tr>
<tr>
<td>Rural Farm</td>
<td>3.0</td>
<td>1.6</td>
<td>3.8</td>
<td>6.9</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Source: Appendix, Table 26

**Socio-Economic Classification of Occupations**

The data presented in Tables G. and H. show the relative importance of the various occupational groups of workers, according to socio-economic classifications. Census figures providing complete information for every occupation in the several branches of the petroleum industry are not available. The following analysis, based on Tables G. and H., concerns the information "in terms of 116 occupations for men and 52 occupa-
tions for women" which are grouped by the Census into eleven broad categories: professional and semiprofessional workers; proprietors, managers, and officials, except farm; craftsmen, foremen, and kindred workers; etc.

No attempt has been made to re-group any of the occupations other than to list separately the foremen and inspectors who are classed as craftsmen by the Census. Proprietors, managers and officials cannot be segregated, and they are included together as higher managerial personnel in this analysis; craftsmen and kindred workers are classified as skilled workers; operatives and kindred workers, as semi-skilled workers; and laborers, as unskilled workers.

The arrangement of the socio-economic classes in Tables G. and H. does not pretend to present a ranking of these groups as to their economic importance. Generally speaking, the collective bargaining process now characteristic of American industrial relations is usually carried on between the wage-earning group of employees and the higher managerial personnel, or management. While it is recognized, of course, that employee representation often may include workers from those in the "other employees group", and even, in some instances, those from the foremen group, the arrangement of Tables G. and H., for all practical purposes, presents the

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workers according to the broad groups that will be most involved in the collective bargaining phase of industrial relations that will be discussed more fully in the following section of this study.

### TABLE 6.

**DISTRIBUTION OF EMPLOYED WORKERS OF PETROLEUM INDUSTRY BY SOCIO-ECONOMIC CLASS OF OCCUPATION AND BRANCH OF INDUSTRY, 1940**

<table>
<thead>
<tr>
<th>Socio-economic Classes</th>
<th>Total</th>
<th>Production</th>
<th>Refining</th>
<th>Pipeline</th>
<th>Filling: Station</th>
<th>Total, excl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>785,960</td>
<td>181,860</td>
<td>178,980</td>
<td>17,420</td>
<td>407,700</td>
<td>378,260</td>
</tr>
<tr>
<td>Higher Managerial</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Personnel</td>
<td>26.3</td>
<td>8.3</td>
<td>6.1</td>
<td>3.9</td>
<td>44.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Foremen</td>
<td>2.7</td>
<td>5.9</td>
<td>4.7</td>
<td>11.4</td>
<td>0.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Wage-Earners</td>
<td>57.8</td>
<td>71.2</td>
<td>54.3</td>
<td>70.7</td>
<td>52.6</td>
<td>63.2</td>
</tr>
<tr>
<td>Skilled</td>
<td>(9.7)</td>
<td>(19.6)</td>
<td>(16.3)</td>
<td>(25.8)</td>
<td>(1.5)</td>
<td>(18.3)</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>(43.0)</td>
<td>(51.5)</td>
<td>(24.1)</td>
<td>(17.7)</td>
<td>(48.5)</td>
<td>(37.0)</td>
</tr>
<tr>
<td>Unskilled</td>
<td>(5.1)</td>
<td>(0.1)</td>
<td>(13.9)</td>
<td>(27.2)</td>
<td>(2.6)</td>
<td>(7.9)</td>
</tr>
<tr>
<td>Other Employees</td>
<td>13.2</td>
<td>14.6</td>
<td>34.9</td>
<td>14.0</td>
<td>3.2</td>
<td>24.1</td>
</tr>
<tr>
<td>Professional</td>
<td>(3.3)</td>
<td>(5.2)</td>
<td>(8.9)</td>
<td>(3.2)</td>
<td>(3.1)</td>
<td>(6.9)</td>
</tr>
<tr>
<td>Clerical</td>
<td>(8.8)</td>
<td>(8.8)</td>
<td>(23.6)</td>
<td>(10.0)</td>
<td>(2.3)</td>
<td>(15.9)</td>
</tr>
<tr>
<td>Protective</td>
<td>(0.4)</td>
<td>(0.2)</td>
<td>(1.4)</td>
<td>(0.6)</td>
<td>(0.1)</td>
<td>(0.7)</td>
</tr>
<tr>
<td>Service</td>
<td>(0.5)</td>
<td>(0.2)</td>
<td>(0.7)</td>
<td>(0.2)</td>
<td>(0.7)</td>
<td>(0.4)</td>
</tr>
<tr>
<td>Not Classified</td>
<td>(0.2)</td>
<td>(0.2)</td>
<td>(0.3)</td>
<td>(0.2)</td>
<td>(0.1)</td>
<td>(0.2)</td>
</tr>
</tbody>
</table>

Source: Appendix, Table 27.

The inclusion of filling station workers in the petroleum industry socio-economic occupational structure presents a rather misleading picture. The bargaining position of the higher managerial personnel is exaggerated with more than one-
fourth of the workers in this group; the group of semi-skilled workers also is given undue importance (43.0%). This situation arises because of the peculiar distribution that obtains for the filling stations where more than nine-tenths of the employees are either higher managerial personnel or semi-skilled workers. As previously pointed out, it would be more realistic to analyse the occupational structure of the industry with the filling station workers excluded. When this is done, a quite different situation exists.

Higher managerial personnel, instead of representing more than one-fourth of the industry workers, now are less than ten per cent; foremen are increased to almost six per cent as compared with the former three per cent; the wage-earning group approximates two-thirds, and the professional, clerical and other employees are increased from 13.2 per cent to 24.1 per cent.

The technological character of the industry also is better reflected by excluding the filling station workers. The professional group, including such occupations as technical engineers, chemists, research workers, and laboratory technicians is almost as strong relatively, as the higher managerial group.

In the absence of more complete and detailed data, any comparison of the several industry branches must take into consideration the possibility that occupations, perhaps
similar in description, may be appraised differently depending upon their relative importance in the various branches.

It is unfortunate that no separation is possible as to the number or percentage of proprietors, officials and managers among the higher managerial personnel. The relatively small proportion of pipe-line higher managerial personnel is probably due to the ownership of pipe-lines by the large integrated oil companies, while the production branch has the largest percentage of higher managerial personnel because of the increasing amount of drilling operations being done by small, independent contractors. Since there are less than 500 operating refineries in the United States, the greater proportion of refining higher managerial personnel are more likely to be managers than proprietors or officials.

Among the foremen group the disproportionate share in the pipe-line branch may be due to some over-classification of gaugers who are classified as inspectors in the census. Figures published by the National Conference Board indicate

\[\text{31 Cf. Appendix, Table 7.}\]

\[\text{32 Figures compiled by the National Industrial Conference Board from Interstate Commerce Commission reports give the following socio-economic distribution when the occupations are combined in a manner closely resembling the groupings employed by the Census: administrative, 1.7%; professional, 1.6%; foremen, 6.3%; skilled, 28.3%; semi-skilled, 20.2%; unskilled, 26.7%; clerical, 12.6%; other workers, 2.5%}\]
Plate XVI

Research Laboratory Assistant
foremen and field superintendents represent only 6.3 per cent of some 20,000 employees of interstate pipeline companies.

In the wage-earning group, each industry branch has its individual pattern. The production branch, for example, reports almost no unskilled workers (0.1%), while more than half of its employees are in the semi-skilled occupations. The refining branch reports the largest proportion (24.1%) of wage earners in the semi-skilled group, with almost an equal division of the remaining wage earners between the skilled (16.3%) and the unskilled (13.9%) groups. The pipeline branch also has an equal division between the skilled (25.8%) and the unskilled (27.2%) groups, but these proportions are somewhat higher than for the refining branch.

There is also a sharp contrast among the branches with respect to the professional and clerical workers. Both production and refining have significant proportions of their workers in the professional group; the percentage of the refining branch being higher than for the production branch. Only in the refining branch is there any large concentration of clerical workers, which accounts for the relatively lower percentage of wage-earners in refining as compared with the production and the pipeline branches. If clerical workers were grouped with the wage-earners, the relative percentages of the three branches would be about the same: 80.0, 77.9, and 80.7 per cent respectively for production, refining and pipeline.
Plate XVII

A Pipeline Construction Worker

The "bulldozer" is used to clear the rough terrain over which the pipeline will be laid.

Melville, Louisiana

Photo by Rosskam
Distribution of the occupational classes by industry branch (Table H.) is of less significance for comparative purposes because of the relatively small proportion of pipeline workers in the total petroleum labor force (excluding filling stations). However, it does serve the purpose of indicating the relative employment opportunities among the several branches for the various occupational classes.

**TABLE H.**

**DISTRIBUTION OF SOCIO-ECONOMIC OCCUPATIONAL CLASSES IN THE PETROLEUM INDUSTRY BY BRANCH OF INDUSTRY, 1940**

<table>
<thead>
<tr>
<th>All classes</th>
<th>Total</th>
<th>Production</th>
<th>Refining</th>
<th>Pipe-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher managerial</td>
<td>100.0</td>
<td>48.1</td>
<td>47.3</td>
<td>4.6</td>
</tr>
<tr>
<td>Personnel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foremen</td>
<td>100.0</td>
<td>51.0</td>
<td>39.7</td>
<td>9.3</td>
</tr>
<tr>
<td>Wage earners</td>
<td>100.0</td>
<td>54.1</td>
<td>40.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Skilled</td>
<td>100.0</td>
<td>51.4</td>
<td>42.1</td>
<td>6.5</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>100.0</td>
<td>67.0</td>
<td>30.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Unskilled</td>
<td>100.0</td>
<td>0.3</td>
<td>83.8</td>
<td>15.9</td>
</tr>
<tr>
<td>Other employees</td>
<td>100.0</td>
<td>29.0</td>
<td>68.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Professional</td>
<td>100.0</td>
<td>36.4</td>
<td>61.4</td>
<td>2.2</td>
</tr>
<tr>
<td>Clerical</td>
<td>100.0</td>
<td>26.7</td>
<td>70.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Protective</td>
<td>100.0</td>
<td>14.6</td>
<td>82.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Service</td>
<td>100.0</td>
<td>22.4</td>
<td>77.6</td>
<td>-</td>
</tr>
<tr>
<td>Not classified</td>
<td>100.0</td>
<td>35.7</td>
<td>59.5</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Source: Appendix, Table 27.

The more significant features of this distribution reveal that more than four-fifths of unskilled labor is employed by the refining branch, with petroleum production
furnishing the greater employment to foremen and skilled and semi-skilled workers. The opportunities for professional workers are almost two to one in favor of the refining branch as compared with the production branch. Approximately three-fourths of all the clerical, protective, and service workers are employed in the refining branch of the industry.

Since more than nine-tenths of employment in the petroleum industry, excluding the marketing branch, is about equally divided between production (48.1%) and refining (47.3%), the following chapter will present a brief description of some of the principal occupations of these two branches.
Summary

From this brief analysis of its labor force, the petroleum industry may be characterized as a White, male industry. Its numerical strength in the national labor force, measured by its relative importance in the several industry divisions in which branches of the industry are represented, is not very great.

The largest proportion of the petroleum industry is found in what might be called the "pseudo-branch" of retail filling stations, a fact which stems from the attempt by the major companies in the early nineteen thirties to control market outlets through the purchase, building, and operation of thousands of filling stations throughout the country. Later, after 1935, the majors rapidly disposed of their legal titles to filling stations in order to avoid the payment of chain-store taxes and Social Security taxes; yet they retained nominal control of these outlets through devious and nefarious leasing and contract practices.

Excluding the spurious filling station branch, the majority of the labor force in the petroleum industry is about equally divided between the production and refining branches. Although the refining branch employs some female and Non-white workers, for all practical purposes, the two branches are alike in several respects: the labor force of each is predominantly White and male; both have been influenced by the impact of technological improvements which is reflected by
the rather large proportion of their male workers in the professional and skilled-labor groups; and both are "middle-aged" in that their median ages are around 37, almost midway between the usually accepted minimum and maximum ages of 14 and 64.\footnote{The compulsory retirement age is 65 at the Baton Rouge refinery of Esso Standard Oil Company, according to Mr. William Reymond, manager of the employee-relations department.}

Despite these similarities, there are also very sharp contrasts implied from the personal characteristics of the labor force in the two branches of petroleum production and refining. The petroleum production branch has almost two-thirds of its workers in the South compared with only one-third for the refining branch. This fact, and the greater tendency for petroleum production workers to live in rural areas result from the very basic difference between the two branches: the migratory nature of the production branch. The petroleum production workers must follow the producing activities to the source of crude petroleum, whereas the refinery workers do not have to move about so frequently and consequently probably enjoy a longer job tenure and greater security than the petroleum production workers.

The socio-economic distribution of the workers in these two branches of production and refining also indicates differences in their occupational structures. To some extent, these differences are very apt to be related to the economic
organization of the two branches. In the refining branch there are less than 400 operating refineries; although only one-third of these are operated by major companies, the latter provide employment for more than eighty per cent of the refinery workers. On the other hand, there are thousands of oil-producing concerns; the average company is a small independently-owned business. This fact may account for the larger proportion of the petroleum production labor force among the higher managerial personnel. Incidentally, more than one-third of the proprietors of oil-production concerns will be found working in the oil fields, a fact which would imply that their employee-relations are more likely to be on a personal level than those between management and employees of the large refineries.

These similarities and differences between the labor force characteristics of the production and refining branches are sociologically important. They imply varying occupational opportunities in the two branches for various types of workers. Subsequently the significance of the personal characteristics and the occupations of the labor force will be evidenced by their effect upon, and by their determination of, the system of human relations within the social structure of the industry.

34 Appendix, Table 29.
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CHAPTER 7

OCCUPATION CHARACTERISTICS OF THE PETROLEUM INDUSTRY*

Modern technology during the years since the first World War has been one of the most influential factors that have changed almost completely the business methods and the manufacturing processes of American industry. Concomitant with recent technological developments has been the growth of the huge financial holding company featured by its

* The following discussion is based upon information compiled from a number of sources; a few of the more important are, Technology, Employ-and Output per Man in Petroleum and Natural-Gas Production, a study made in 1938 by the staff of the Works Progress Administration in cooperation with the Bureau of Mines (hereinafter this study will be referred to as Petroleum and Natural-Gas Production); David Leven, Done in Oil; "Petroleum Production and Refining", Industries Series No. 29-1 (April 1945), a press release by the War Manpower Commission; Max W. Ball, This Fascinating Oil Business; Joe E. Brown and C. Wilson Randle, Earnings in Southwestern Petroleum Industry, Bureau of Labor Statistics, U. S. Department of Labor (Washington: Government Printing Office, 1944); Dictionary of Occupational Titles, Part I, Definition of Titles, U. S. Employment Service, Department of Labor (Washington: Government Printing Office, 1939). These published data are further supplemented by information obtained from personal interviews and visits to oil fields. Representatives of the Standard Oil Company (New Jersey), Danciger Refining Company, William Helis Drilling Company, Currruth Pipe-line Company, and Union Oil Company of California were interviewed. Visits also were made to the Vinton oil field at Lake Charles and to the South Baton Rouge oil field; also, a trip was made through the refining plant of the Standard Oil Company at Baton Rouge, Louisiana.

pyramidal subsidiary companies and its diffused ownership among thousands of individuals who are only remotely associated or acquainted with actual operations of the business they collectively own. These tremendous economic organizations that now dominate the American industrial scene have become dependent upon machine methods of mass production and upon a form of organizational control that in many respects assumes the characteristics of a bureaucracy. Consequently all factors of production have been so mobilized by "big business" as to effect the highest possible economy and efficiency. Included among these factors of production, of course, is the human factor or labor force.

The impact of modern technology upon the labor force is evidenced in the type of job to which the worker is assigned. Directly affecting the occupational structure and the status and role of the worker in the industrial plant is the size and the nature of the economic organization. The larger and more bureaucratic the organization, the greater is the division of labor or job specialization. Technological machine processes of the modern industrial plant not only replace manual labor in the methods of economic production, but they also serve to reduce industrial occupations to the routine level of button pushing, lever pulling, valve

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turning, instrument reading. Furthermore, in an industry such as the petroleum industry where technical devices are increasingly being used to control its complicated processes of production and manufacture, widespread application of industrial instruments tends to require a less skilled type of labor. Although every new technique may not reduce or eliminate the requirements for skilled labor, the general effect of technology is to standardize occupations and thus to reduce the amount of training required. The net result is the use of fewer skilled workers and a greater use of semi-skilled labor.\footnote{For example, petroleum production has almost no unskilled workers (0.1%), 19.6 per cent skilled and 51.5 per cent semi-skilled; the corresponding figures for petroleum refining are 13.9 per cent, 16.3 per cent, and 24.1 per cent. See supra, Chapter 6, Table 6. Cf. C. A. Koepke and S. T. Woal, \textit{Changes in Machinery and Job Requirements in Minnesota Manufacturing, 1931-1936}, Works Progress Administration, National Research Project No. L-6 (Philadelphia, 1939), p. 43.} Occupations are so minutely specialized that the worker becomes little more than a human machine confined to a single operation requiring relatively little occupational skill or training. With the transformation of occupations into mere jobs where the "individual worker merely attends a semi-automatic machine, monotony and boredom are inevitable ... In recent years technology has perhaps tended to lessen the amount of highly repetitious, standardized work, but it has accomplished this only by eliminating the human element altogether."\footnote{Lorwin and Blair, \textit{op. cit.}, p. 155.}
In an industry where occupations are highly specialized and standardized, job security tends to become less dependent upon occupational skills and more upon the ability of the worker to learn and to adjust himself to the routine nature of the job to which he is assigned. Frequently promotions are based upon seniority rather than upon individual initiative, creative ability, or job performance. "Individualism in the sense of freedom of action does not exist to any appreciable extent in the large corporation. For the few who are in control, such a state may obtain; but for the thousands of workers, their fortune is to adapt their individualism to the demands of the organization." Within the giant corporation with its rigid rules and regulations for the efficient operation of its bureaucratic hierarchy it is almost impossible for the individual worker personally to contact management at the policy-making level in order to make known any dissatisfaction he may have with his job. Sensing the ease with which he can be replaced, a worker may refrain from voicing too strenuously his dissatisfaction rather than risk his job, or he may join a labor union that will bargain for his "rights". As Golden and

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7 As William F. Whyte states the problem: "To the extent that management is able to deliver the 'pork chops' without union pressure, the worker is often ready to shift his allegiance to the company. In short, a large proportion of American workers are willing to let management and organized labor compete for their support." Industry and Society (New York: McGraw-Hill Book Company, 1946), pp. 171-172.
Ruttenberg point out, "Workers organize into labor unions not alone for economic motives, but also for equally compelling psychological and social ones, so that they can participate in making decisions that vitally affect them."  

Since the worker spends considerable time at his job, his occupational status plays an important part in the attitudes and feelings he develops toward his job, his employer, and toward his fellow workers. It determines his position in the social structure of the industry; that is, whether he will be classified as an unskilled, skilled or semi-skilled worker or in some other general category. It likewise places him in a dynamic group setting with other workers from which develops a system of informal group relationship that has been found to play a vitally important role in modern industrial relations.

What may be said about American industry generally is particularly well illustrated by the technology of the modern vertically integrated petroleum industry. Some innovations that have produced the giant oil corporation with its dependency upon mass production and finance capital

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already have been discussed. What is of sociological interest here is the influence modern technology has had upon the human relationships within the petroleum industry. One of the major sources that provides important clues as to the extent of such influence is the occupational characteristics of the industry.

During the past quarter of a century there have been considerable changes in the occupational structure of the petroleum industry. Technological changes in the production and refining branches of the industry have increased the demand for technical experts, research workers, and other professionally trained personnel. The newer techniques employed in these branches of the industry have increased the need for workers with the ability to learn to assume responsibility for the mechanical operation of complicated instruments and other automatic devices. The increasing use of mechanized equipment has reduced the amount of direct manual labor required, and has led to a very complex system of occupational classifications, a large per cent of which are classified

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10 Supra, Chapter 3.
11 To cite one example, that of the 27 occupations related to refinery still operations: still and tank inspector, still cleaner, still tube cleaner, still operator, still-pump operator, still tender, still-tender assistant, stillman, stillman assistant, atmospheric vacuum unit stillman, coking stillman, continuous crude oil stillman, cracking stillman, cracking coil stillman, cross stillman, debutanization plant stillman, gas plant stillman, stillman helper, continuous crude oil stillman helper, cracking coil stillman helper, debutanizing plant stillman helper, junior stillman, low pressure stillman, pentant plant stillman, pipe stillman, pressure stillman, re-run stillman, Cf. Dictionary of Occupational Titles, p. 1240.
as semi-skilled jobs. Some indication of the extent to which the human factor has been routinized into minute specialization may be obtained from the variety of the 130 occupations listed in 1940 for petroleum production and the 370 for petroleum refining.\(^\text{12}\)

It is obvious that any analysis or description of the occupational characteristics in the petroleum industry will necessarily have to be selective; therefore, the following discussion will be limited, for the most part, to the male workers in the petroleum production and refining branches of the Southern region.\(^\text{13}\) These workers comprise forty per cent of the petroleum industry labor force, and forty-eight per cent of all petroleum production and refining workers. Furthermore, the data for the Southern region concerning occupations, conditions of work, wages and hours are more complete than for any other region, or for the entire industry.\(^\text{14}\)

It has been one of the most important and significant developments of the modern petroleum industry that in-

\(^{12}\) Dictionary of Occupational Titles, pp. 1238-1240.

\(^{13}\) Such a limitation seems justified from the preceding discussion of the labor force in Chapter 6. There it was shown that 96 per cent of the petroleum workers were males, and, aside from the marketing branch (which is covered rather fully in Chapter 5), 95 per cent of all petroleum industry workers were employed in the petroleum production and refining branches.

\(^{14}\) Brown and Randle, op. cit.; Forbes, Flush Production; and "Wages in Petroleum Drilling and Production in the Southwest, April 1944", Monthly Labor Review, XL (February 1945), 348 ff.
creased numbers of highly trained professional personnel have found employment in the production and refining branches of the industry.

Prior to 1920, generally marked as the beginning of the modern technological era of the petroleum industry, petroleum production and refining operations were largely carried on by "practical" oil men. Originally these men, recruited from all walks of life, were entirely ignorant of the oil business. They came to the oil fields to work or to seek their fortunes in the rapidly growing new industry, and both the early oil-producer and the refiner had to learn the oil business from experience during an era of "rough and tumble" tactics under the laissez-faire dictum of "every man for himself".

As the petroleum industry has grown and greater stability to its operations has been assured through the enactment of proration and conservation programs, it has attracted a less venturesome type than the original practical oil man. Individual ingenuity and shrewdness have given ground before scientific and technological developments. While a few practical oil men still remain in the industry, they are becoming proportionately fewer, and gradually they are being displaced by more technically and professionally trained personnel.

15 Hager, op. cit., p. 42.
This trend is very definitely reflected for example in the exploration and drilling operations of the industry. In former days geologists were held in almost scornful contempt by the practical oil-field men; they were described by such epithets as "pebble-pups" or "rock hounds", apppellations still used throughout the industry although now devoid of their earlier ridicule. The entrance into, and the acceptance by, the petroleum industry of the professional geologist was exceedingly slow. Prior to 1912, although there were some independent consultants, most geologists found employment with federal or state geological surveys, or as teachers in various universities and colleges throughout

16 Production activities, as indicated in Ch. 3 of this study, are those concerned with the operation and maintenance of completed oil wells; the production branch generally includes those activities related to (1) finding and exploring prospective oil fields, (2) drilling oil well operations, and (3) the operation of producing oil wells.

17 Hall, op. cit., p. 28.

18 "Most (oil companies) continued, even in the early years of the present century, to locate test wells on the basis of topography on the advice of a superintendent of drilling or other non-geologic employee... However, by 1908, a few companies were cautiously following geologic advice...(and) by 1915 few even among the small companies closed an option or tested an isolated location that had not been mapped, with contouring of structure, by geologists." David White, "Petroleum Development in America", Bulletin of American Association of Petroleum Geologists, XIX (April 1935), 500.
By studying outcrops of rock formations, the geologist finds many important clues for locating potential oil-bearing areas.
the country.\textsuperscript{19} During the following ten years, 1912-1921, not only graduates but many under-graduates in the departments of geology, paleontology, physics, and mineralogy were recruited by the oil companies for their newly organized departments of geologic exploration.\textsuperscript{20} Since 1921, the professional geologist has become an integral part of the larger oil concerns; however, the recent trend of the oil companies to contract their drilling operations, and the fact that many of the contractors are not large enough to maintain a special staff of petroleum engineers and geologists, may have tended to increase the number of independent consultant geologists.\textsuperscript{21}

Geologic and geo-physical crews now employ complicated devices to map scientifically the surface contours of prospective oil-bearing regions and to probe deep into underground structures. Not only is the geologist concerned with locating potential sources of crude petroleum, but he has


\textsuperscript{20} "Large staffs were recruited to the depletion first, of the geological surveys and bureau of mines, and finally, of the university departments of geology." White, \textit{op. cit.}, p. 500.

\textsuperscript{21} In 1943, one-half of the active members of the American Association of Petroleum Geologists were employed by major companies, one-fifth were with small companies, one-fourth were consultants or independents, and the remainder were serving with various geologic and geo-physical crews. Cf. \textit{Independent Petroleum Company}, p. 72.
Plate XIX

Surveying Oil Lands Under Difficulties

The head chain man of the survey crew plumbs the depth of water every ten feet as he "swims" across hyacinth-filled bayou. This crossing is accomplished by laying his body across as many of the hyacinths as possible. This distributes the weight of his body and utilizes the air-filled hyacinth roots as floats, thus enabling him literally to crawl over the water. The water reaches depths of seven or eight feet in the middle of the bayou, not counting the depth one can sink into the mud.

Bayou Sale District, Louisiana

Photo by Libsohn
now assumed many of the responsibilities that formerly were solely those of the driller or "tool pusher".22 Because of the improved scientific techniques of modern oil-well drilling he must decide "when and where more wells should be drilled and whether to drill to deeper sands";23 he must decide the rate of drilling, and when and how frequently the well is to be "read" by electric well logging methods.

In addition to the more than 5,000 members of the American Association of Petroleum Geologists,24 other professionals also have been added to the staff of oil-production activities: the mineralogists who study the mineral content of sediments brought to the surface in the drilling mud or core samples, and the paleontologists whose study of microscopic fossils in underground strata give important clues to oil-bearing formations.

Today the work of these professional men has become so specialized it is now accepted as indispensable to successful exploration and drilling operations. The risks of oil prospecting have been so reduced and the characteristics

22 The supervisor of several drilling operations.
23 Ball, op. cit., p. 28.
24 Founded originally in January 1916 as the Southwest Association of Petroleum Geologists (its present name was adopted in 1918), its membership has grown from 94 in 1917 to 5,489 in 1948. Bulletin of the American Association of Petroleum Geologists, XXXIII (March 1948), 390-499.
of sub-surface formations so accurately determined that drilling an oil well has progressed from a "hit or miss" operation to a scientific venture. Not only does the work of the professional staff which now constitutes about six per cent of the petroleum production labor force require technical skill and college training, but it requires exceptionally vigorous men for field activities where the work often is in isolated virgin territory and which must be done in all kinds of weather. There is an increasing demand for these highly trained personnel and many colleges throughout the country, especially those in or near oil-field regions, such as Louisiana State University, now offer full curricula in the fields of geology and petroleum engineering.

The almost completely changed techniques of petroleum refining during the past twenty-five years also have created a demand for professionally trained personnel.

From the simple process of distillation in the small skimming plant, modern petroleum refining now has developed more than forty complex processes\(^{25}\) that may be carried on within a single huge refinery. The modern refinery with its maze of pipes and stills not only separates crude oil into its component parts but the recently developed catalytic

\(^{25}\) A recent issue of a leading trade journal graphically describes 44 processes of modern refining methods. *Oil and Gas Journal*, XLVI (April 1, 1948), 117-164.
cracking process actually alters its chemical composition. For many years while kerosene was primarily used for illuminating purposes, the elementary distillation process was adequate. Neither large plants nor technological skill was required. Later, the development of the internal-combustion engine, the increased use of the automobile, and the substitution of electricity for kerosene as an illuminant were effective factors that altered the kind and quantity of petroleum products. These factors and the influences of World War I stimulated a rapid expansion and development of refining techniques which, in turn, created a tremendous demand for skilled technicians and research workers.

The professionally trained technician -- the engineer, chemist and physicist -- has become a vital part of the modern refinery labor force.26 The petroleum engineer is important in dealing with engineering problems peculiar to petroleum refining; the industrial engineer works in close cooperation with the chemical engineer in planning plant construction and expansion; chemists, physicists and laboratory personnel are used in testing and developing more efficient and economical methods of producing existing petroleum products, improving the quality of such products, and developing new products and new processes for their manufacture.

26 For distribution of technical employees of the petroleum industry in 1944, see Appendix, Table 30.
One of the most significant occupational developments in the refining branch has been the tremendous growth in the number of personnel engaged in research activities. Since 1920, the research staff of petroleum refineries has increased from less than two hundred to an estimated eight to ten thousand workers in 1944. In 1920, five petroleum refineries employed 145 research personnel, and by 1927 there were twenty-eight companies employing 788 research workers, or about four per cent of all industrial research personnel in the United States. During the period 1927-1938 petroleum refining, except for the radio industry, had the greatest increase (540%) of all industries in research personnel. In 1938 fifty-three oil companies employed 5,033 research workers, or 11.4 per cent of all industrial research in the

27 These research personnel should not be confused or identified with the "professional and semi-professional workers" reported by the Census (see Appendix, Table 27.), which includes non-research occupations of civil and mechanical engineers, accountants, lawyers and so forth. While it is true that many professionally trained research workers are included in the Census professional classification, the latter does not include the large number of routine laboratory test- ers and other non-professional persons employed in the research departments of the large refineries.


30 Ibid., p. 42.
country, and twelve major oil companies were among the forty-five companies employing more than half of the research personnel in American industry.31

In addition to the technical and research workers, the modern large refinery also employs a number of other professionally trained personnel such as accountants, lawyers, physicians, nurses, and others.

Professional personnel usually enter the refining branch as assistants. As they gain experience they are advanced in the fields of research and engineering, or they may be promoted to administrative positions where their added experience and technical training is invaluable to policy-making decisions.32 Professional workers are required to have a college education and the workers employed in research laboratories generally must have had at least training in high school chemistry and mathematics.33

Another important result of petroleum technology upon the occupational structure of the industry is evidenced by the large amount of skilled and semi-skilled labor required, both in the petroleum production and refining branches. Because of the numerous occupational classifications to which

32 *Petroleum Production and Refining*, p. 5.
33 *Loc. cit.*
these workers are assigned, it would be impossible within the scope of this study to present a comprehensive analysis and description of more than a very few of the more important occupations. The following discussion will be limited, then, to those occupations peculiar to the drilling operations of the production branch, and to petroleum refining.

Although many new techniques have been introduced into oil-well drilling, they have had little effect upon the size and composition of the drilling crew. Rather than to increase the number of drilling crew members or to give the crew the added responsibilities of such innovations as oil-well cementing, electric well logging, core analysis and other technical devices and methods now employed to reduce the risks and increase the efficiency of drilling operations, the usual practice has been to have such work done by individuals or concerns specializing in such operations. The last major change in the composition of the drilling crew came with the introduction of the rotary drill shortly after the turn of the twentieth century when the number of crew members was increased from the two or three members who operated the cable-tool drill to the present five or six members needed for the operation of the rotary drill.

Except for the rotary driller who now has the assistance of certain technical apparatus such as gauges and meters to guide him in his drilling operations, most of the work
of the drilling crew is manual labor. However the trend in recent years to employ more exacting and scientific drilling techniques makes it quite probable that more technical training and ability will be required of future drilling crew members.\textsuperscript{34} It may also be expected there will be fewer occupational distinctions based upon present skills or job performances if further substitution of diesel or electric power for steam driven equipment continues. Already a number of concerns make no distinction in the duties of the occupations referred to in the industry as "roughnecks": the rotary fireman, rotary floorman, and the derrickman. In such instances the crew members are assigned to a variety of duties on the derrick and they are classified as "rotary driller helpers",\textsuperscript{35} and regardless of the duties they perform, they are paid a uniform wage rate.\textsuperscript{36} Unless some radical change occurs in present methods of drilling oil wells, the same number of crew members will be required to drill future oil wells as is required today.

While technical efficiency has increased the speed

\textsuperscript{34} \textit{Petroleum and Natural-Gas Production}, p. 123; also, \textit{"Petroleum Production and Refining"}, p. 7.

\textsuperscript{35} Brown and Randle, \textit{op. cit.}, p. 5.

\textsuperscript{36} Incidentally the wage rate for rotary driller or floormen helpers is much lower than that paid the individual occupations of firemen, floormen, and derrickman. \textit{Cf. infra}, Table L.
of rotary drilling operations, this gain in speed of operations as a labor displacing factor has been off-set somewhat by the greater depths to which oil wells can be and are being drilled. Furthermore, the increasing demand for crude petroleum products has so expanded and accelerated the search for additional oil reserves that drilling activities can be expected to require more rather than fewer drilling crews.

While technological improvements have resulted in a very limited reduction in the amount of manual labor required in drilling operations, quite the contrary is the case in petroleum refining. The rapid and radical changes accompanying the growth of the petroleum refining from the small batch-still type plant to the modern refinery with its continuous processes and mass production of numerous petroleum products have mechanized many operations. A large number of refining occupations have been reduced to the mere regulation of operations through the manipulation of valves, switches and other such mechanical devices. These labor-saving devices necessary to the complicated processes of modern refining have actually not reduced the aggregate refinery labor force; the influence of technology upon the occupational structure of petroleum refining has been

37 Petroleum and Natural-Gas Production, p. 123.

38 In 1947, there were 33,098 oil wells drilled -- only 874 short of the record set in 1920. Oil and Gas Journal, XLVI (January 29, 1948), 154.
qualitative rather than quantitative. 39 While technology makes it possible through instrumental and mechanized control for one worker to perform duties formerly requiring several men, other factors have counteracted the labor-displacing influence of automatic controls.

The expansion of refinery facilities in order to increase and improve the quantity and quality of petroleum products "has tended to raise the responsibility and training requirements of the operating labor (because of) the fact that it is usually easier to displace the most routine control operations by automatic devices, so that the workers who are left after the routine operations have been transferred to automatic control have additional responsibilities and require knowledge of the operations of at least a large portion of the whole plant." 40 To assume such responsibilities and to acquire such knowledge of modern refinery operations considerable experience and training on the job must be obtained. For that reason, and also to maintain continuous operations, the larger refineries have instituted intensive in-training programs for their foremen, and have made definite efforts through various types of worker-participation plans 41 to reduce their labor turnover to a minimum.

39 Brown and Randle, op. cit., p. 19; also, Petroleum and Natural-Gas Production, p. 292.
40 Petroleum and Natural-Gas Production, p. 292.
41 Many large companies such as the several Standard Oil Companies, and Shell Oil Company have employee stock purchasing plans, annuities and benefit programs, etc.
Plate XX

A "Rough" Road to an Oil Well

On the day this picture was taken the road was in relatively good condition. On many days the truck seen in the distance could not have passed at all, and the two men working at the nearest well would have had to come to the oil field by boat transportation via the canal.

Choctaw Oil Field, Louisiana

Photo by Rosskam
As a consequence the aggregate refining employment has changed very little.42

An interesting contrast between the working conditions and the occupations of the wage-earning groups43 of oil-field and refinery workers is provided by a comparison of these two divisions and indicates the wide range of variation among the occupational characteristics within the petroleum industry.

In contrast to the refinery workers, the oil-field workers usually come from families who have been in the "oil game" a long time and who have followed the migration of principal oil-producing centers from Pennsylvania, through Ohio, Indiana, Illinois and Kansas; to California, and finally to the southwestern States of Texas, Oklahoma, and Louisiana.44 They are a product of an adventurous pioneering people, for "the gamble of drilling for oil was one that captivated the spirit of men in whom the instinct for taking chances was inherent..."45 The nature of their work requires

42 The change in petroleum refining employment as reported by the Censuses of 1930 and 1940 showed only an increase of 1,336. See Appendix, Table 25.

43 Particular attention is given here to those workers for whom adequate occupational data are available. These wage-earner groups include those workers generally classified as skilled, semi-skilled or unskilled; they do not include service and protective workers, nor any clerical workers who may be paid on an hourly basis.

44 Petroleum and Natural-Gas Production, p. 42; Forbes, Flush Production, p. 160.

45 Zimmerman, op. cit., p. 500.
them to follow the "rig" from place to place, and in many instances oil-well sites are located in isolated or rural areas where adequate housing facilities are at a premium. In recent years, the enactment of conservation measures of proration and well-spacing and the fact that major oil companies hold oil leases on large tracts of land with proven reserves have tended to reduce somewhat the mobility of the oil-field workers. While fewer wells are drilled in an area because the former practice of drilling as many oil wells as rapidly as possible has been all but eliminated, a prospective oil-field is not so likely to be exploited nor exhausted so soon, and drilling operations tend to be spread over a longer period of time in one area. The use of the automobile and the house-trailer also have enabled the migratory oil-field workers to live in more populated areas.46

Working and living conditions of the oil-field workers vary, of course, from area to area. For example, in the marsh regions of southern Louisiana, drilling crews live in "quarter boats" anchored in the bayous and swamps. These living quarters are actually 2-story barges about the size of an average army barracks building; they have dormitories, showers, wall lockers, and water taxis provide transportation to and from the mainland.47 Another interesting and fascinating

46 According to the Census of 1940, forty per cent of oil-field workers lived in urban areas, forty-five per cent in rural, non-farm areas, and fifteen per cent on rural farms. Cf. Appendix, Table 26.

Project Is now nearing completion in the Gulf of Mexico, eight miles off the shores of Grand Isle, Louisiana. Here the Humble Oil Company, a drilling company subsidiary of Standard Oil (New Jersey), has spent hundreds of thousands of dollars to erect a gigantic drilling platform in fifty feet of water. In addition to the drilling platform on which will be built a complete drilling rig, there are two 2½ acre decks (206' x 110') which will provide accommodations for housing 54 men in comfortable living quarters.

Contrasted with the oil-field workers, refinery workers live a less exciting and strenuous life. Usually they have comfortable homes in urban areas and live within easy commuting distance of the refinery. Most refinery workers are employed by the larger refineries, and the trend among the major oil companies is to build even larger refineries. Generally, the large refineries in the South are located near "feeder pipe-lines, railroad centers, water transportation

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49 About three-fourths of the 10,583 refinery workers included in the Southwestern Petroleum Industry study were employed by companies classed as large refineries with more than 250 employees. Cf. Brown and Randle, op. cit., Table 10, p. 21.

50 In 1947, compared with 1946, not only was the proportional capacity of small refineries (those with less than 10,000 barrels capacity daily) reduced to 11.4 per cent from 15.3 per cent, but numerically the number of small refineries was reduced to 252 from 363. Oil and Gas Journal, XLVI (January 29, 1948), 148.
facilities, or large centers of population, where cheap transportation cost and easy access to crude petroleum supplies and consumer-markets are available. Of the smaller plants that usually locate near the supply of crude petroleum and cater almost exclusively to local demands, one-third are found in the Southern States of Texas, Oklahoma, and Louisiana. This fact and the fact that large refineries frequently locate in suburban areas, for instance the Standard Oil refinery at Baton Rouge and the Cities Service plant at Lake Charles, Louisiana, undoubtedly account for the rather high proportion of refinery workers residing in the rural areas of the Southern region, compared with other regions, and also for the significant number of refinery workers who engage in part-time farming.

Another factor contrasting the working conditions between the drilling and refining operations is that the work in the oil-fields, continuing twenty-four hours a day in all kinds of weather, is hard, dirty and hazardous outdoor work

51 Brown and Randle, op. cit., p. 16.
52 Loc. cit.
53 Appendix, Table 3.
54 Appendix, Table 26.
both for the drilling crew and the professional worker, while the greater part of refining work is less strenuous and is performed indoors. Drilling operations require men with physical stamina who are capable of performing their arduous duties in all sorts of inclement weather, and the constant overhead movement of heavy iron and steel equipment of blocks, cables, and pipes continually exposes the crew members to the imminent danger of serious accidents. Although improved equipment and drilling methods have eliminated many work hazards, and most of the workers now wear "tin helmets" and special shoes with re-inforced toes that provide partial protection from falling objects, the accident rate among oil-field drilling crews is the highest in the petroleum industry, and one of the highest in the country.56

There are few occupations in the refining branch for which unusual physical requirements are demanded, and almost no refinery jobs are exposed to the degree of danger that exists for the oil-field workers. In 1945, the injury index of drilling operations compared with refining was 169.83 to 22.98, and corresponding figures for frequency and severity rates were respectively for the two divisions, 74.73 to 10.98, and 9.51 to 1.20.57 In a few selected occupations some


57 The injury index is the frequency rate plus the severity rate per 10,000 hours worked; the frequency rate is the number of disabling injuries per million hours worked; and the severity rate is the number of days lost per 1,000 hours worked. The Petroleum Data Book (Dallas: The Petroleum Engineering Publishing Co., 1947), p. L-11. For a comparison of injury rates in drilling and refining operations, see Appendix, Table 31.
refinery workers are subject to constant hazards, as for example the excessive temperatures in "hot rooms", falling from heights, handling volatile petroleum products at high temperatures and pressures, and the dangers of sulphurous odors, dirt and grime encountered in cleaning out the cramped quarters of various kinds of stills.58 Such dangers are apt to be inherent to the work performed by unskilled labor, or by maintenance men who work outdoors repairing, installing and cleaning plant equipment; in such cases, the refineries carry on intensive safety campaigns and offer incentive awards to individuals or departments with the best safety records.59

The make-up of a drilling crew largely depends upon the drilling method and the kind of power to be used. Except for Pennsylvania,60 most drilling operations today employ the rotary drill, and the majority of these are operated by power generated by a portable steam boiler, although in a few cases diesel and electric power motors are being used by the large companies.61

59 Loc. cit. Also information obtained from William Reymond, Employee Relations Manager, Esso-Standard Oil Company, Baton Rouge, Louisiana.
60 Oil and Gas Journal, XLVI (January 29, 1948), 154.
61 Brown and Randle, op. cit., p. 4.
A typical rotary drilling crew consists of a driller, and from three to five "roughnecks": a derrickman, fireman or boilerman, and two or three floormen. "Roustabouts" or the common laborers employed about the well-site are usually not considered part of the drilling crew.

Each member of the crew has his special duties to perform, and a well-trained crew, although seemingly working leisurely, does its work with almost mathematical precision and remarkable speed. Cooperation is absolutely essential for the personal safety of the crew and for economic operation. A worker who cannot "get along" with the other members of the crew, or who is disliked by his fellow workers, is soon made aware of the fact by having every type of menial and dirty job assigned to him.

Once the well is "spudded in", drilling operations continue night and day until the well is "brought in", or is abandoned. Formerly the drilling crews worked in two shifts of twelve hours each; today the more prevalent practice is for three crews to work eight hour shifts or "tours".

Hiring policies and job promotions in the oil field depend largely upon the size of the company and the extent of its operations. Very few companies are engaged only in drilling operations; the majority also maintain and operate wells in a completed oil field. It is the customary practice

62 Of 401 companies operating in the Southwest, only 17 were engaged exclusively in drilling operations. Cf. Brown and Randle, op. cit., p. 2.
whenever a company has production activities for the new worker to be assigned to a "bull gang" in this division rather than beginning with a drilling crew. In the "bull gang" the worker is assigned to a variety of jobs: laying lead pipe-lines, reading gauges and meters, cleaning field equipment, and becoming generally acquainted with field production activities. His work is heavy, dirty and often dangerous; he learns to work outdoors in all kinds of weather, and he soon becomes familiar with oil-field terminology and equipment when he is assigned work around the oil-well derrick and can observe the actual drilling operations. After he has obtained sufficient experience and knowledge, he may be promoted or upgraded by being transferred to a drilling crew as a "roughneck". Generally speaking, the drilling branch follows a system of promotions based upon seniority: from floorman, to fireman, to derrickman, and finally to driller; later, if he is fortunate, he may become a "tool pusher", the supervisor of several drilling operations.

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63 A group of "roustabouts", generally referred to as the common laborers in the petroleum industry; however, their duties are usually more responsible than those of common laborers and their wages are, as a rule, higher than those paid common labor. Cf. Monthly Labor Review, LX (February 1945), 350.

64 It is considered "good practice" for all men who aspire to supervisory positions to have had an apprenticeship in the oil field. Many of the larger companies encourage college students who are prospective petroleum engineers and geologists to spend the summer months working as a roustabout or roughneck.
Floormen who work on the derrick floor under the direct supervision of the driller have a variety of occupational classifications: well puller, casing puller, clutchman, rig operator, rod wrencher, etc., or they may be classified simply as rotary driller helpers. Floormen manipulate heavy tongs that look much like over-sized wrenches to tighten or unloosen the joints of drill-stem pipe or casing; they assist the driller in running pipe and casing into and out of the well, help the derrickman rack and unrack the drill pipe in the tower of the derrick, and generally assist about the derrick repairing machinery and the rig whenever necessary.

The fireman is in charge of the boiler that provides the steam for generating power for the operation of the fast moving rotary drill, for raising and lowering of cables and blocks, and for providing electric power for lighting the rig during night operations. As was mentioned previously, there is a trend to classify all floormen and firemen as rotary driller helpers and to make no distinction between their duties, especially where electric, diesel or gasoline motors are used to provide power.

As implied by his title, the derrickman works most of the time in the tower of the drilling rig. From his position near the top of the rig he guides and attaches, or

65 Dictionary of Occupational Titles, pp. 761, 1015.
Plate XXI

A Derrickman Climbing the "Rig"
Choctaw Oil Field, Louisiana

Photo by Rosskam
detaches, the drill stem from the "elevator" while balancing himself on a small wooden platform suspended high above the derrick floor. In this precarious position he must handle heavy pipe, casing or tubing carried upwards at a rate of about four feet per second. The derrickman probably works in the most dangerous position on the rig, about 25 feet from the top of a derrick 64 to 180 feet in height. With almost no protection he is required to stay aloft in the cold, windy weather and in hot summer sun; during inclement weather his position is made more dangerous because of slippery conditions. Few men have the sense of balance and the physical strength, or the agility required to work on the small platform high in the top of the derrick tower. In line of promotion, the derrickman is next to the driller and frequently he relieves the driller and supervises the drilling operations.

The most important and perhaps the most colorful figure in the drilling crew is that of the driller. He has numerous jobs to supervise and he must at all times be alert to every detail of the drilling operation. In earlier days he was the sole "boss" of the entire drilling operation. It

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66 A clamp that grips the end of a casing or drill pipe as it is raised or lowered from and into the wall.
67 Leven, op. cit., p. 402.
68 The average derrick is about 84 feet. Ibid., p. 386.
was his responsibility to decide whether or not to continue drilling, and without the aid of modern equipment and technology he became noted for his skill and his ability to "talk to the rope". In cable-tool operations he had an uncanny ability to know almost everything about the drilling operation that was proceeding at the bottom of the well merely from the feel of the drill rope or cable. He knew when tools were loose, when the bit became dull and needed to be changed, the approximate type of formation through which he was drilling, and how fast he should continue to drill. He knew intimately every operation performed in the oil field, for "typically, he (had) served an 'apprenticeship' as a 'roughneck', slipping and shuffling about ankle-deep in mud over innumerable derrick floors."

Although almost all technical details of drilling operations are now under the supervision of a petroleum engineer or geologist, the experience and skill of the driller is still the key to successful oil well drilling operations. He is responsible for the safety of his crew and for supervising all operations on the rig. He must see that no time is unduly lost and must be prepared to meet any emergency that might interrupt drilling operations such as fires, blowouts from excessive gas pressures, and unexpected geological

69 Ibid., p. 397.

70 Monthly Labor Review, LX (February 1945), 349.
formations. Today the driller seldom relies on his former ability to talk to the rope; he must be able to manipulate mechanical controls that operate the rotary drill table, and to read and interpret the gauges and other instruments which show the weight on the drilling bit, the revolutions per minute of the rotary drill, and the mud pressure in the drilling hole. He is also required to keep accurate logs of his drilling in order that decisions may be made by the petroleum engineer or geologist.71

Under the strenuous conditions of oil field work, crew members are under constant physical strain and they become "worn out" at an early age; the average ages of the various crew members range probably from 32 to 44.72 As they grow older, or tire of the continuous moving from one oil field to another, or when they marry and have children, many of them find more steady and less exciting and dangerous work, for example as pumpmen in production operations in a completed oil field. "In 1940, thousands of families throughout the Gulf-Southwest were living in relative comfort at pumping stations or on the leases to which they had 'retired' from the more strenuous field operations."73

71 Cf. Petroleum and Natural-Gas Production, p. 82.
72 One large company, for example, reports the average age for its crew members as follows: drillers 36, fireman 36, derrickman 32, and floormen 32; another company reports corresponding averages of 44, 41, 36, and 34. Monthly Labor Review, LX(February 1945), 349.
73 Forbes, Flush Production, p. 160.
In rare instances, however, the driller may retire to become a drilling superintendent, a lease owner, contractor or a producing executive; however, "it is sometimes asserted that 'drillers don't quit - they're fired'. Not infrequently, in fact, there are successive discharges for carelessness, injury, drunkenness, or age. Many a 'broken down driller' finishes his career with lowered status and diminished earnings -- as pumper, machinist in a shop or plant producing oil-field equipment, or farmer." 74

Contrasted with those of the drilling crew, the operations and occupations of the large refinery are strikingly different. The complexity of the continuous refining process which is inherent to the mechanized mass production of hundreds of petroleum products requires rigid and precise control over every phase of the refining operations. This has been accomplished by reducing almost to a minimum the amount of manual labor involved. Innumerable switches, valves, pumps, meters, temperature and pressure electrographs, and other mechanical devices have been so extensively installed that the flow and control of petroleum through an intricate series of stills and pipes has become, for the most part, semi-automatic. "Trial and error has given way to scientific measurement. The old cylindrical (shell) stills, with their 'lock boxes', have all but disappeared before the pipe stills

74 Monthly Labor Review LX (February 1945), p. 349.
and cracking towers, where no man sees the oil, fires the oil. It is all done by remote control, by throwing switches and watching dials, by instruments that never sleep."  

Depending upon the nature and extent of its refining processes, the modern refinery may employ from several hundred to several thousand workers, with the operations of the plant divided into several major divisions each embracing a number of smaller departments. Broadly speaking, refinery wage-earners may be grouped into three general classifications: those employed on maintenance, repair and construction work, most of whom belong to the familiar crafts of carpenters, electricians, machinists, welders, and pipe-


76 Of 485 operating refineries in August 1944, 16 employed over 1,000 wage-earners, one-fourth employed from 100 to 1,000 workers, and three-fourths employed fewer than 100 workers. Cf. Philomena Marquardt, *Union Agreements in Petroleum-Refining Industry in Effect in 1944* (Bulletin No. 823), Bureau of Labor Statistics, U. S. Department of Labor (Washington: Government Printing Office, 1945), p. 1. Typical divisions of the Esso-Standard Oil Refinery at Baton Rouge, Louisiana, which employs about 9,000 workers are, Maintenance and Construction, Refining and Oil Movement, Chemical Products. Altogether there are 10-12 divisions divided into 39 departments. The Maintenance and Construction Division, for example, includes such departments as boilermakers, general labor, machinist, pipe-fitter, meter and instrument, carpenter and painter, mason, and reclamation. From the appendix of *Standard Oil Employees Association Contrast with the Manufacturing Division of* Standard Oil Company, *Louisiana Division*, an unpublished mimeograph copy.
fitters; a large group of unskilled service and protective workers and general laborers; and those employed on jobs characteristic to the refining process such as stillman, treaters, pumpmen, still firemen, and the numerous helpers assigned to these occupational groups. The job functions of this latter group of highly specialized and standardized occupations are determined by the various units in the continuous refining process.

Despite the routine nature of many refining occupations, very few job applicants are now considered unless they have at least a high school education. Formerly this was not the case and many of the older process workers, from the standpoint of seniority service with the company, very likely are not high school graduates. However, since the processes of petroleum refining have become so complicated and mechanized, the majority of the refining process occupations now require an ability for learning quickly how to read and to interpret accurately numerous instruments readings, and to handle other intricate and delicate mechanical devices. Thus, the technological requirements of refining occupations, together with the increasing number of high

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77 See Appendix, Table 33.

78 For examples, gas plant stillman, cracking stillman, low pressure stillman and so forth. See Supra, footnote 8.
school graduates among the job applicants have made it more difficult for prospective workers to obtain refinery employment without the equivalent of a high school education, except perhaps for such service jobs as janitors, or other unskilled labor. 79

The general practice of large refineries is to assign new workers to a general labor pool for apprenticeship training; the period of this training varies with the individual companies. 80 While in the labor pool, which is similar to the "bull gang" in the oil field, the worker is classified as a common laborer. He learns the layout of the refinery, where tools are kept, and the general work routine of the refinery. During the training period the worker is given instructions about the organization of the refinery, and trained operators explain and demonstrate various plant equipment and their operations. Special instructions are given in safety classes on fire prevention, accident prevention and other safety precautions. Each worker is provided with a work manual which instructs him just how the job to which he will be assigned is to be performed. If special


80 Ibid; also additional information was obtained from the Training Office of the Standard Oil Refinery at Baton Rouge, and from the Baton Rouge Office of the Oil Workers International Union, C. I. O.
protective clothing is required, this is provided by the company; usually denim overalls, gloves, and a head covering of some kind is worn. Many refinery workers now have adopted the "hard hat" or the familiar "tin helmet" of the oil field workers.  

From the general labor pool, the worker is upgraded to a job in the refining process. Here, as a helper, and under close supervision he learns to open and close valves, fire stills and boilers, read meters and gauges, or other types of operations pertinent to his job. Promotions are based primarily upon seniority, except for foremen who are selected by the company usually on basis of qualitative factors.  

The occupation of stillman is the most important in the refining process. His duties vary according to the type of operations, but generally he is responsible for the continuous and safe operation of one or a battery of stills in which crude oil is distilled. He regularly checks on all operations by reading meters, gauges, and other instruments that assist him to control the flow, pressure and temperature of the several stills under his supervision. In some plants

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81 Monthly Labor Review LVII (August 1943), 201 ff. and supplemented by information from Mr. Pollard of the Training Office at Standard Oil Company.

82 From information obtained in interview with Reymond of Standard Oil Company; also Brown and Randle, op. cit.

83 Supra, footnote 9.
his work is entirely supervisory; he directs the work of subordinate stillmen and their helpers, and the pumpmen and their helpers.\footnote{84}

Under the direction of the supervisory stillman, controlmen and stillmen helpers observe, record and maintain the temperature, pressure and rate of flow and the levels in the various units in which petroleum products are being processed. In order to carry out their duties, they are required to read large panel-boards covered with numerous flow and pressure gauges, meters and thermometers that are automatically recording the various stages of the refining process under their supervision.

Pumpmen and their helpers maintain and operate steam and electrically driven pumps which are used to force the petroleum products through the various stages of their processing from one tank or still unit to another. They also operate the pumps used in loading and unloading crude petroleum and refined products to and from tankers, trucks, boats and pipe-lines. The helpers under direct supervision of the pumpmen open and close the valves that regulate the flow of products.

\footnote{84 Information from previously cited sources concerning employment practices and occupational requirements have been supplemented for this and the following occupational duties performed by the workers in the refining branch by the descriptions listed in the \textit{Dictionary of Occupational Titles}.}
Plate XXII

Stillman Helper and Control Board

Control of the continuous refining process is maintained by gauges and electrographs, such as those shown in the photograph, which record the pressure, temperature, etc. This control board in a catalytic cracking unit probably has between fifty and seventy-five recording devices.

Esso-Standard Refinery, Baton Rouge, Louisiana

Photo by Rosskam
One of the principal occupations in the refining process is that of treater. He has a number of helpers whom he directs in the processes which remove sulphur and other impurities from the various refined products. His duties, too, are highly mechanized; he has numerous gauges and meters to read, and he has gravity and color tests made to check on the accuracy of the treatment processes.

If the company employs no compounders or blenders, the treater may also be responsible for the blending and mixing of various grades of gasoline and oils to conform to the specifications of customers. Most of his work is accomplished through the manipulation of valves that admit varying quantities of mixing agents such as tetraethyl lead; he also adds the proper amount of dye to give the product a distinctive color.

Another large group of workers in the refining process are the still firemen. It is their responsibility to maintain the furnaces at required temperatures by adjusting various valves according to the readings of the meters and gauges that record the temperatures and pressures of the several stills. Since the furnaces are automatically operated, he must be alert to detect any overheating or leaking by looking into the furnaces and be prompt in reporting any apparent irregularities indicated by the color of burning fumes or gas as they are observed issuing from the stack.
While these few job descriptions by no means exhaust the list of occupations that are characteristic of processing operations in the large refinery, they do serve to indicate the wide variety of occupations found within the petroleum industry. In general, the occupations of the petroleum production branch, particularly those in the drilling operations, when compared with those in the refinery require greater physical stamina and less formal education. The migratory work in the oil fields is hard, manual labor performed outdoors in all kinds of weather conditions and often in isolated areas; it is exceptionally dangerous work, both for the professional and non-professional workers.

Although a number of services associated with oil-well drilling such as oil-well cementing and electric well-logging are provided by specialists, the drilling crew remains the basic working unit. It functions as a small, closely knit group and often moves intact from one drilling rig to another. Relationships among the members of the crew while on the job are very informal, and are more "social" than "technological" in the sense that continued membership in the crew depends not only upon the skill of the workers but also upon their willingness and ability to cooperate and to "get along" with each other. Every member of the crew,

85 See Appendix, Table 36.
over and above his regular duties, is expected to assist in repairing the derrick and other drilling equipment, and to help on other jobs around the rig whenever such work is required. They are expected to be ready to assume whatever duties are necessary in order to "keep the rig running" in the event of an emergency situation such as a blow-out, fire, or an accident to a fellow worker.

The considerable amount of interaction and direct communication among all members of the crew tends to reduce the social distance between superiors (tool pusher or driller) and subordinates. The leadership of the driller is recognized by other members of the crew because of his experience and skill rather than because he occupies a position of authority on the drilling rig.

The majority of occupations in the large refinery, on the other hand, have become highly specialized and routine in nature, and the duties primarily involve the operation of semi-automatic equipment that requires a minimum of manual labor or physical exertion. They have become so circumscribed and delimited by mechanical controls that there is little or no opportunity for an individual worker to exercise his initiative or to introduce any amount of originality to his job.

Refinery workers are also to be found working in small groups in many of the processing units; for example,
a cracking still may be operated by a crew of eight or nine men, including a shift foreman, a stillman, a junior stillman, and five or six helpers ranking as Helper No. 1, No. 2, or No. 3. Unlike the drilling crew, however, a refining unit is not autonomous, but is only one of many units necessary to the continuous refining process. While relationships among the group in the small unit may be very informal, such relationships tend to become modified because of the interdependence of all units engaged in the various phases of the continuous refining process. The workers in the smaller units are first responsible to, and an integral part of, the larger or "blue-print" organization which, for purposes of economy and efficiency, requires each member of every unit to perform his job in strict accordance with prescribed rules and regulations governing his occupation. The freedom of the worker is very limited; for instance he is not expected to service his own equipment, but to call on the specially trained maintenance and repair, or the meter and instrument crews whose special duties are to keep the mechanical equipment in working order.

In the modern refinery with its complex technological division of labor, channels of communication very often are indirect and impersonal, and important decisions may

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86 Moore, op. cit., Ch. VI, pp. 94-115.
require the countersignature or approval at several administrative levels. Even in the smaller units, leadership frequently rests as much, if not more so, upon seniority as upon recognized skill and ability.

To a large extent, the wide variations thus far noted in this occupational analysis may be attributed to differences in operations. The petroleum industry with its characteristic integrated form of economic organization includes several branches which are quite different in their functions and operations. This is obvious from the comparison between the drilling and refining occupations. Each branch has different requirements of skill, training and experience, and it is doubtful whether occupations in various branches of the petroleum industry could be ranked according to their relative importance in an occupational hierarchy for the entire industry. Certainly it is almost impossible to measure variations of occupational skills merely from job descriptions such as those given above. It would be difficult "to insure that 'the same job' is in fact an identical operation. Similar occupational designations do not necessarily represent an identical input of skill or energy."

Likewise, differences in job descriptions may not always indicate real differences in skill.

Since occupational stratification based upon relative skills is an important sociological factor in studying human relationships, or the system of industrial relations within an industry or plant, one approach to the problem of occupational differences is through a comparison of wage structures. But even in this approach, "it cannot be too strongly emphasized that the pattern of interplant (or intraplant) wage structure is primarily a description of a set of relationships and tells nothing about the causes or reasons for the differences which are described, though it may provide some leads."88

Generally speaking, while wage differentials may usually be expected to reflect differences in occupational skills, variations in the wage structure also may be associated with other factors: the size and geographical location of the industry or plant; the nature, methods and processes of the work; the composition of the labor force with respect to age, sex and race; and, by no means the least, the degree of unionization of the industry or plant. Considerably more detailed information than is now readily available concerning hours and wages would be required before

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88 Loc. cit.
the relationships of all these factors to the petroleum industry wage structure could be fully discussed.

Nevertheless, the data for the two important branches of the industry, petroleum production and refining, are sufficient to indicate the wide variations in the wage and occupational structures between these two branches, and between the wage and occupational structures within each of the industry branches. The basic causes for these differences are rather obscure, but they may be due in part to differences in the types of operation, or to traditional practices within the petroleum industry; however, it is also apparent that location, size and degree of unionization are equally as important factors that affect the wage structure.

89 "One of the major causes of labor disturbances is inequalities of pay between like jobs... Industry has always paid different rates for different kinds of jobs, but all too frequently industry had no basis through which they could prove to the worker that the rate of pay he was getting was just and fair...". D. W. Weed, supervisor of wage rates for General Electric Company, "Wage and Salary Administration", Promoting Constructive Relations in Industry, Summary Report of Silver Bay Industrial Conference, 21st Year (New York: Industrial Service National Council of Y.M.C.A.'s, 1938), p. 52. How refined wage rates may become is also illustrated from the fact that rates for many jobs at the Esso-Standard Refinery in Baton Rouge, Louisiana, are carried out to the thousandth of a dollar, and in the case of shift rate differentials, to the ten thousandth of a dollar; for examples the following are the base rates and shift rates paid to selected occupations in the mechanical division: mason, labor crew, $1.680 and 1.7640; sign painter, 1.695 and 1.7798; lead burner, 1.705 and 1.7903; instrument mechanic, 1.715 and 1.8008. From Exhibit A of the Agreement (as of June 23, 1947) between Standard Oil Co. of New Jersey and Independent Industrial Workers' Assn.
Traditionally, the wage structure is based upon hourly wage rates. Various occupations, presumably because of differences in required skills, are paid varying hourly rates of pay, and in general weekly wages are determined by the hourly wage rate and the number of hours worked during the week. A study of hours worked and the weekly wages paid in the petroleum production and refining branches reveals, on the one hand, a very noticeable similarity between the two branches with respect to the average number of hours worked, and the practices and policies regarding over-time and shift work, and paid vacations. On the other hand, a multiplicity of hourly wage rates is characteristic both between the industry branches, and between similar occupations within the same branch.

From 1935 through 1947 (see Table J. below), a period which includes the war years, the work week for the petroleum production branch has averaged about an hour more than in refining operations: 40.1 and 39.1 respectively. However, both branches are now operating on an eight hour day and forty hour week, with time and one-half paid for any overtime work during a day or week. In both branches of the

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90During the war years, a considerably longer workweek was worked; in the petroleum production branch the hours for the years 1943-1945 were 44.3, 44.9 and 44.1, and correspondingly for the refining branch they were 46.0, 48.0, and 42.2. Cf. Appendix, Table 35.

91From the Oil Workers International Union agreements with Atlantic Refining (Port Arthur, Texas), Sinclair Oil Company (a nation-wide agreement), and Gulf Oil Corporation (Port Arthur, Texas); and from the Independent Union agreement between the
industry, the seventh consecutive day of work is usually paid double time.92 Sunday work is not part of a regular work-week schedule and specified holidays are paid time and one-half.

Because it is necessary to keep refining equipment in continuous operation, refining process workers generally are on a 3-shift schedule: a daylight shift, 7:00 AM - 3:00 PM; a "swing" shift, 3:00 PM - 11:00 PM; and a midnight or "grave-yard" shift, 11:00 PM - 7:00 AM. Workers on the "swing" and "grave-yard" shifts are paid premium rates of four and six cents an hour respectively. Non-processing workers in the refinery work only the daylight shift. Similar shift schedules also are in effect in the petroleum production branch. In this branch which includes the drilling operations fifty per cent of the operations operate on a 3-shift schedule, three per cent on a 2-shift schedule, and forty-seven per cent of the operations on a day-light shift only. However, no differentials or premium rates were paid for work on a late shift.93

91 (Continued) employees and management of the Esso-Standard Oil Company (Baton Rouge, Louisiana). Also, Marquardt, op. cit., pp. 4-8, and Walter T. Watson, "Wages in Petroleum Drilling and Production in the Southwest, April 1944", Monthly Labor Review, LX (February 1945), 350 ff.

92 OMIU agreement with Atlantic Refining, and Watson, op. cit., p. 351.

93 Watson, op. cit., p. 351.
General, also, throughout both branches of the industry is the policy of giving paid vacations based upon length of service. The usual practice is to give one week's vacation after one year of continuous service, two weeks' vacation after two or more years of continuous service, and three weeks' vacation after fifteen years of service. 94

Although the number of hours worked during a week affects the amount of weekly wages, the data presented in Table J. indicate the greater influence of the average hourly wage-rates. While the increases in the hourly wage-rates and weekly earnings are interesting, it is not possible here to go into a detailed analysis of all the factors that may have contributed to the fact that weekly wages, for example, have more than doubled since 1935. 95 It might be noted that these significant wage increases have occurred during a period that witnessed the establishment of the Petroleum Labor Policy Board under the National Recovery Act of 1932, 96 the abolishment of oil company employee-representation plans in 1937 under a decision of the United States Supreme Court that upheld the constitutionality of the Wagner Labor Relations Act.

94 Cf. Supra, footnote 91.
95 See Appendix, Table 35.
TABLE J.
AVERAGE HOURS, HOURLY WAGE-RATES, AND WEEKLY WAGE EARNINGS 
IN THE PETROLEUM PRODUCTION AND REFINING BRANCHES

| Period | Petroleum Production | Petroleum Refining | Differences between
| Period | Weekly Average | Hourly Average | Weekly Average | Hourly Average |
| Oct. 1935 | 36.5 | $0.78 | $28.66 | 34.5 | $0.81 | $27.60 | 2.0 | -$0.03 | $1.06 |
| Oct. 1939 | 37.7 | 0.88 | 32.80 | 36.9 | 0.97 | 35.77 | 0.8 | -0.09 | -2.97 |
| Oct. 1943 | 44.3 | 1.12 | 50.82 | 46.0 | 1.22 | 56.10 | 1.7 | -0.10 | -5.28 |
| Oct. 1947 | 40.0 | 1.49 | 60.51 | 39.9 | 1.59 | 63.82 | 0.1 | -0.10 | -3.31 |
| Jan. 1948 | 39.9 | 1.63 | 64.53 | 39.8 | 1.70 | 67.54 | 0.1 | -0.07 | -3.01 |

Source: Appendix, Table 35.

Act, and the reorganization of the Oil Workers International Union (C.I.O.) in 1935. Undoubtedly other factors were important in their influences upon the wage structure of the petroleum industry: the enactment of proration and other oil conservation measures that brought stability to production operations, the refining expansion program, and the demands of World War II. Even were it possible to determine the varying degrees to which these factors have influenced wage increases throughout the petroleum production and refining branches, this would still not explain the wage differentials between the two branches.

The last comparable studies of petroleum production...
and refining earnings made in 1943\textsuperscript{97} very clearly show the
variations between these branches of the petroleum industry. From the distribution of the male wage-earners according to hourly wage-rate intervals in Table K, the very different wage structures of the petroleum production and refining branches is obvious at once. While more than half (55 per cent) of the refinery workers average $1.20 or more an hour, forty per cent of the petroleum production workers received less than $1.00 an hour.

\textbf{TABLE K.}

\textbf{PERCENTAGE DISTRIBUTION OF PETROLEUM PRODUCTION AND REFINERY MALE WORKERS BY HOURLY WAGE-RATE INTERVALS, APRIL 1943.}

<table>
<thead>
<tr>
<th>Hourly Wage-rate</th>
<th>Petroleum Production</th>
<th>Petroleum Refining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Under $0.80</td>
<td>11.9</td>
<td>6.8</td>
</tr>
<tr>
<td>$0.80 - 0.99</td>
<td>30.7</td>
<td>13.3</td>
</tr>
<tr>
<td>1.00 - 1.19</td>
<td>47.9</td>
<td>25.4</td>
</tr>
<tr>
<td>1.20 - 1.39</td>
<td>3.6</td>
<td>41.7</td>
</tr>
<tr>
<td>1.40 &amp; over</td>
<td>5.9</td>
<td>12.8</td>
</tr>
<tr>
<td>Average</td>
<td>$1.02</td>
<td>$1.16</td>
</tr>
</tbody>
</table>

\textit{Source: Appendix, Tables 33 and 34.}

\textsuperscript{97} Brown and Randle, \textit{op. cit.}
Despite the fact that the wage structure generally is accepted as reflecting occupational differentials that are based upon variations in occupational skills, this is not necessarily the case in the petroleum industry. It is apparent from the data presented in Table I, that it is exceedingly difficult to make any realistic comparison between occupations in such widely divergent types of operations as

**TABLE I.**

<table>
<thead>
<tr>
<th>Petroleum Refining</th>
<th>Drilling Crew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stillman, cracking</td>
<td>$1.36</td>
</tr>
<tr>
<td>Stillman, other</td>
<td>$1.25</td>
</tr>
<tr>
<td>Treaters</td>
<td>$1.24</td>
</tr>
<tr>
<td>Pumpmen</td>
<td>$1.22</td>
</tr>
<tr>
<td>Stillman, Helper No. 1</td>
<td>$1.19</td>
</tr>
<tr>
<td>Treaters, Helpers</td>
<td>$1.17</td>
</tr>
<tr>
<td>Pumpmen, Helpers</td>
<td>$1.15</td>
</tr>
<tr>
<td>Stillman, Helpers No. 2</td>
<td>$1.13</td>
</tr>
<tr>
<td>Still Firemen</td>
<td>$1.13</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>$1.21</strong></td>
</tr>
<tr>
<td>Driller, rotary</td>
<td>$1.52</td>
</tr>
<tr>
<td>Driller, cable</td>
<td>$1.15</td>
</tr>
<tr>
<td>Derrickmen</td>
<td>$1.03</td>
</tr>
<tr>
<td>Fireman</td>
<td>$1.03</td>
</tr>
<tr>
<td>Floormen</td>
<td>.99</td>
</tr>
<tr>
<td>Floormen, helpers</td>
<td>.93</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>$1.10</strong></td>
</tr>
</tbody>
</table>

*Source: Appendix, Tables 33 and 34.*

are found in the petroleum production and refining branches. Except for the rotary driller who receives the highest rate of hourly pay in either branch, refinery workers generally have the higher rates of pay. As a group, occupations associated with the refining process averaged ten cents an hour more than the occupations of drilling crew members: $1.21 for
refining occupations, and $1.10 for the drilling crew. Apparently neither job descriptions nor hourly wage-rates, when considered separately, is an adequate criterion of differentials in occupational skills. For example, from the job descriptions previously given, it would seem to be implied that considerably greater skill, training and responsibility are associated with the occupation of derrickman in the drilling crew, compared with the duties of the stillman helper No. 2 in the refinery; yet, on the basis of hourly wage-rates (Table L), the derrickman averaged only $1.03 an hour to the $1.13 an hour paid the stillman helper.

Very clearly, the multiplicity of hourly wage-rates in the petroleum industry results not only from occupational differences due to the different kinds of industry branch operations, but also arises because of differences in location of the operations, the size of company, and the degree of unionization. That such is the case in the petroleum industry seems indicated from Table M, where the wide range of average hourly wage-rates is presented for the petroleum production branches, and for the principal occupation in each of these branches, the rotary driller and the cracking stillman.

Geographically, the hourly wage-rate for all petroleum production workers ranged from $0.95 in North Texas to $1.06 in the Texas Gulf Coast area, with eight different wage-
## TABLE I

**AVERAGE HOURLY WAGE-RATES FOR PETROLEUM PRODUCTION AND REFINING BRANCHES AND FOR ROTARY DRILLERS AND CRACKING STILLMEN, BY REGION, SIZE OF COMPANY AND UNIONIZATION, APRIL 1943.**

<table>
<thead>
<tr>
<th>Region</th>
<th>Petroleum Production Driller</th>
<th>Petroleum Refining</th>
<th>Cracking Stillman</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Southwest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texas Inland</td>
<td>1.03</td>
<td>1.54</td>
<td>1.00</td>
</tr>
<tr>
<td>Panhandle</td>
<td>1.01</td>
<td>1.48</td>
<td>1.00</td>
</tr>
<tr>
<td>West Texas</td>
<td>1.03</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>North Texas</td>
<td>0.95</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>East Central</td>
<td>1.04</td>
<td>1.58</td>
<td></td>
</tr>
<tr>
<td>Southwest</td>
<td>1.04</td>
<td>1.61</td>
<td></td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>1.06</td>
<td>1.58</td>
<td>1.24</td>
</tr>
<tr>
<td><strong>Louisiana</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Louisiana</td>
<td>0.99</td>
<td>1.50</td>
<td>1.06</td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>1.05</td>
<td>1.52</td>
<td>1.22</td>
</tr>
<tr>
<td><strong>Oklahoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.99</td>
<td>1.45</td>
<td>1.05</td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>New Jersey</strong></td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Small Companies</strong></td>
<td>0.88</td>
<td>1.43</td>
<td>0.77</td>
</tr>
<tr>
<td><strong>Medium-sized Companies</strong></td>
<td>0.99</td>
<td>1.48</td>
<td>1.05</td>
</tr>
<tr>
<td><strong>Large Companies</strong></td>
<td>1.10</td>
<td>1.61</td>
<td>1.23</td>
</tr>
<tr>
<td><strong>Union Companies</strong></td>
<td>1.12</td>
<td>1.80</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Non-union Companies</strong></td>
<td>0.97</td>
<td>1.47</td>
<td>n.a.</td>
</tr>
</tbody>
</table>


n.a. indicates not available.

* Small companies are those with from 9 to 50 employees, medium-sized companies have 51-250, and large companies are those with more than 251 employees.

**A union plant is where the majority of workers belong to occupations covered by an agreement with trade or independent unions. Cf. Perlman, *Hourly Earnings of Employees in Large and Small Enterprises*, p. 8.*
rates being shown for the nine sub-regions (including the State of Oklahoma). A similar situation obtains in the refining branch. Here the range of hourly wage-rates is from $1.00 for Inland Texas areas to $1.24 for the Texas Gulf Coast region, and none of the five sub-regions averaged the same rate of pay.

These geographical variations likewise hold for individual occupations, illustrative of which are the varying rates of pay received by the rotary driller and the cracking stillman. The hourly wage-rate of the driller ranged from $1.44 in North Texas to $1.61 in Southwest Texas; the wage-rates for the cracking stillman varied from $1.28 in the Inland Texas areas to $1.48 paid in the Texas Gulf Coast area. Throughout the Southwest cracking stillmen were paid considerably less than in Pennsylvania ($1.55) and New Jersey ($1.53).

The wide variation in wage-rates in the petroleum production branch in the Southwest "can be explained only in terms of a complex interplay of several influences. For example, rates in the Texas Gulf Coast and Southwest Texas areas reflect the presence of very deep drilling and production, extremely high gas pressures, and a high proportion of major companies. On the other hand, the average earnings received by workers in North Texas reflect the absence of the factors mentioned above and the influence of low per-well
productivity, a high percentage of stripper wells, and high per-barrel production cost. The major oil companies have under lease large undeveloped acreages in this area, but their present activity is confined largely to exploratory operations; hence drilling and production are dominated by the smaller independent companies."98

Wage-rate differentials in the refining branch, while they appear to be due to geographical distribution, are in reality probably more the result of the size of the refineries than of geography. "Such variations as exist in petroleum refining in the Southwest are apparently due to size of establishment and processing method rather than to geographical influences. Proximity to a source of crude oil and to cheap transportation facilities has resulted in the location along the Gulf Coast, of the larger refineries using intricate processing methods..."99

The influence of the size of company is apparent from the average wage-rates for the petroleum production and refining branches, and for the driller and stillman occupations. In each instance, the higher wage-rates are associated with the larger oil companies.

Significantly, the greatest wage differentials were between the unionized and non-unionized companies in petroleum

98 Ibid., p. 8.
99 Ibid., p. 19.
production which paid the union rotary driller $1.80 an hour compared with the non-union driller wage-rate of $1.47 an hour. Although no data were given for union and non-union refineries, "union plants in general pay higher wages than do non-union establishments." 100

In summary it would appear that the similarity between the petroleum production and refining branches with respect to the average work-week, over-time and shift pay rates has little effect upon the wage differentials that exist between these two branches of the petroleum industry. These differences in hourly wage-rates that are reflected in the lower average weekly earnings of the petroleum production workers likewise persist regardless of location, size or the degree of unionization of the companies. The influence of these latter factors, while they may explain variations in the wage-rates for each of petroleum production and refining branches, do not tell much about the causes for such differences, nor are they able to establish that greater skills are required in the refining branch despite the higher wages paid to refinery workers.

The relationship between the size of plant and the degree of unionization, however, does appear to have significance. In the petroleum production branch only seventeen or four per cent of 401 oil-producing companies were

100 Ibid., p. 29.
unionized, but these seventeen companies employed one-third (32.7 per cent) of all petroleum production workers,\footnote{Ibid., p. 7.} and in the refining branch, one-half (49.5 per cent) of 117 refineries were unionized and employed approximately 84 per cent of all refinery workers.\footnote{Ibid., p. 20.} Thus it would appear that unionization is most prevalent among the larger companies in both branches. If, as is undoubtedly the case, unionization generally has been more rapid and wide-spread among the larger oil companies, then it is clear that the refineries will be unionized to a greater degree since they tend to be much larger than the producing companies. It is very plausible, then, to conclude that the more extensive unionization of the large refineries is at least partially responsible for the higher wage differentials that are paid to the refinery workers.

Such a conclusion might imply that petroleum workers become members of unions primarily in order to secure higher wages. Since traditionally labor-management disputes have often been translated into terms of hourly wage-rates, this may very well be the case. Undoubtedly workers are interested in improving their economic status, and they may feel they have achieved some progress toward this goal if they secure higher wages, even though inequalities of wage-rates
between similar occupational groups still persist, as for example seems to be the case in the petroleum industry. Certainly the history of the American labor movement fails to record any considerable initiative on the part of the owners of industry, or their representatives in management, to anticipate the needs of workers in advance of the latter's demands that usually have been made through organized unions.

If, as it is generally assumed, workers have formed labor unions in the petroleum industry to improve their economic status and to secure their jobs, then the extent and influence of such unionization is of particular sociological significance, regardless of whether the unions are national trade or industrial unions, or local independent unions. Unionization represents a social process within the framework of industry that provides the workers with an agency and means for expressing their wants and for seeking satisfaction for these needs.

Very possibly the economic motive, expressed in terms

103 In 1943, of 28,491 refinery employees in union companies, 15,026 or approximately 53 per cent, were under agreements with unions affiliated with either the Oil Workers International Union (C.I.O.) or the International Union of Operating Engineers (A.F.L.), whereas 13,465 or about 47 per cent were in companies having agreements with independent unions of various types. Of 17 union oil-producing companies, 9 were affiliated with the C.I.O. union, 2 with the A.F.L., and 6 were independent unions. Brown and Randle, op. cit.
of higher wages or other economic wants, may not be the only, or even the principal, reason for workers to organize a union. Golden and Ruttenberg,\textsuperscript{104} point out that workers seek three things from their jobs: they want a certain amount of job and wage protection to provide them an adequate standard of living, they want an opportunity for self-expression and creative outlets, and they want ties and bonds of group relationships. If, as Whyte reports, "our interviews with American workers, supported by almost all opinion polls, indicate quite clearly that a worker's life, hopes, and expectations center around his job",\textsuperscript{105} then human relations within the economic framework of modern industry involve more than mere consideration of economic values such as wages, hours and conditions of work. So-called "labor problems" need not be stated in terms only of desires for higher wages, shorter hours, paid vacations, or improved conditions of work. Important as such factors may be, labor maladjustments may arise equally as well because of psychological or social reasons. Workers may suffer from the anxiety and tension associated with the monotony of their jobs, they may be unable to adjust to, or work out favorable relationships with, the group with whom they work, or they may believe the jobs to which they are assigned are above or

\begin{footnotes}
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\textsuperscript{104} Cf. The Dynamics of Industrial Democracy, p. 7.
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\textsuperscript{105} Industry and Society, p. 171.
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below their capabilities. But, even granting that labor un-
rest and dissatisfaction "are often stated in terms of wages,
hours of work, and physical conditions of work, is it not
possible that these demands are disguising, or in part are
the symptomatic expression of, much more deeply rooted human
situations which we have not yet learned to recognize, to
understand, or to control?" ¹⁰⁶

The technological requirements for economic and effi-
cient large-scale manufacturing processes demand more and
more standardization and specialization of occupations, and
a greater division of labor in the tasks in the petroleum
industry. While new jobs requiring particular skills or
technical training may be created for the designing, con-
struction, maintenance and repair of machines, or for scien-
tific research, these are relatively few compared with the
number of job functions that are reduced to such mechanical
movements as throwing switches, reading gauges, pushing
buttons, or perhaps a series of single operations in the
continuous refining process.

But regardless of how mechanized the tasks assigned
to the laborer become, labor itself remains a non-mechanizable
human factor. The attitudes and feelings of the workers

¹⁰⁶ Roethlisberger, cited in "The Fruitful Errors of
Elton Mayo", Fortune XXXIV (November 1946), pp. 183, 238.
toward their jobs and toward their supervisors and employers are essential elements in the productive process. No worker is completely devoid of such attitudes and feelings. They are basic to the social organization of the petroleum, or any other, industry. "The matters of importance to workers ... are not settled primarily by negotiating contracts. If industry today is filled with people living in a social void and without social function, a labor contract can do little to make cooperation possible."107

If workers join organizations of their own choosing because of their common interests within the petroleum industry and for purpose of finding satisfaction for their needs, whether economic, psychological or social, then the kind and extent of their organization and the manner in which they organize themselves constitutes an area of industrial human relations that is sociologically important. The organization of the system of industrial relations between management and labor within the intricate and complex social structure of the modern petroleum industry will be the subject of the following section.

107 Loc. cit.
PART V

THE ORGANIZATION OF INDUSTRIAL RELATIONS IN THE PETROLEUM INDUSTRY
CHAPTER 8.

BUROCRATIC FEATURES OF MANAGEMENT ORGANIZATION

In preceding sections this study of the petroleum industry as a social organization has discussed the importance of its social heritage to its growth and development, the intricacies of its formal and economic structure, and the occupational characteristics of its labor force. In this section attention will center about the description and discussion of the manner in which social order is achieved and maintained, and how the dynamic processes of industrial relations are regulated and controlled. "From this point of view, social organization is the procedure of ordering, disciplining, and of restraining ... it involves both a complex of rules by which order is maintained and a complex of forces and mechanisms whereby these rules are enforced."¹

Within the petroleum industry, organization in its sociological connotation refers among other things to the coordination of those activities that result in the formation of particular interest-groups. Of special concern here are the social groups of "management" and "labor" as they are represented in the system of industrial relations.

The concept of industrial relations as employed here refers to the system of relationships that arise from the social interaction between management and labor. While this concept\(^2\) is sufficient for the purpose of this section, the terms "management" and "labor" require further clarification.

The term management often is rather loosely used. In a general sense it is employed to designate directors and officers of a company, or it is used to refer to the heads of particular departments of a company. It may also be used to refer to the entrepreneur who owns and operates his own business. For general or popular usage any or all of these references may serve their purposes, but for the purpose of sociological analysis it is necessary to assign a more definite and explicit meaning to the term management. In order

\(^2\) There is some disagreement among sociologists whether industrial relations can be concerned only with management-labor relations. Blumer, on the one hand, seems to agree "that industrial relations are becoming increasingly a matter of alignment of organizations - of unions on one side and industrial corporations on the other." Herbert Blumer, "Sociological Theory in Industrial Relations", American Sociological Review, XII (June 1947), 276. Moore, however, argues that this is a "quite unacceptable constriction" (see Wilbert E. Moore, "Current Issues in Industrial Sociology", American Sociological Review, XII (December 1947), 651). Moore, in another source, states industrial relations "include not only what is ordinarily called industrial relations in the narrow sense - namely, the relations of management and labor - but also the whole network of organized activity that constitutes the productive system." Cf. Moore, Industrial Relations and the Social Order (New York: Macmillan Company, 1947), p. 6.
to do this, the general concept of management employed in this discussion will follow that of the bureaucratic official as described by Max Weber.3

Management are those officials who are appointed by the owners of the business, or by the representatives of the owners. The appointed officials occupy their positions because of their technical training and qualifications; their rank and authority are determined by their positions in an administrative hierarchy. Their activities are governed by well defined rules and regulations, and their offices are considered their chief occupation or career, with promotions based upon ability and experience.

This definition of management now provides a means whereby it will be possible to determine whether, and to what extent, management in the petroleum industry approximates the concept of the officials of a bureaucratic administrative staff. Its usefulness depends upon its applicability to the economic structure of the concerns within the petroleum industry. The degree to which the major oil companies approximate bureaucratic organization will be discussed later.

Having defined management in terms of the bureaucratic official, it would be a simple matter to classify all non-administrative officials as constituting labor. However, any such dichotomous classification would be very misleading with respect to industrial relations. Perhaps no one definition of labor will be entirely satisfactory, but in terms of industrial relations the general term "labor" will be construed here to exclude management and those non-administrative personnel who, for whatever reasons, are ineligible for membership in the bargaining agency: the trade, industrial or independent labor union. Obviously, a number of employees are excluded from the social groups of both management and labor by the above definitions. Such exclusion, however, imposes no great hardship on this discussion of industrial-relations organization since, in actual practice, collective bargaining between management and labor often excludes such groups as clerical, professional and service workers; therefore the composition of the labor group will vary according to whether or not certain groups of employees are excluded from union membership.

Having now defined the terms "management", "labor",

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4 As Moore points out in the case of the clerical force, their position is an anomalous one. They are not highly paid, and their position is roughly that of "workers", and "in management-labor disputes, clerical workers are usually to be found aligned with managers and not with those whose income they rarely exceed and frequently fail to match." Moore, Industrial Relations and the Social Order, p. 158 f.
and "industrial relations", the study of the organization of industrial relations will be divided into two parts: first, a consideration of the bureaucratic organization of management, and, in the following chapter, a discussion of labor organization.

The term "bureaucracy", at least in popular usage, frequently is used as an epithet signifying an abusive, distasteful form of organization, usually of a political government. The layman is confused by the many channels to which he is referred for the answer to a question which to him appears to be a very simple one. He is bewildered by the "red tape", "passing the buck", and the innumerable forms to be filled out. Sociologically, value judgments are extraneous to the consideration of bureaucratic organization, and the concept of bureaucracy is equally applicable to social organizations other than governments and their agencies.5

"Bureaucracy" is a concept or "ideal-type" construct6

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5 "Bureaucracy is the term usually applied to a system of government the control of which is so completely in the hands of officials that their power jeopardizes the liberty of ordinary citizens." Harold J. Laski, "Bureaucracy", Encyclopedia of the Social Sciences (Vol. III), (New York: MacMillan Company, 1937), p. 70.

6 See Howard Becker, "Constructive Typology in the Social Sciences", in Harry E. Barnes, Howard and Frances Becker, Contemporary Social Theory (New York: D. Appleton-Century, 1940), Ch. 2, pp. 17-46.
described by Max Weber\(^7\) which is used here to facilitate the description and analysis of the complex social organization of the petroleum industry.

An earlier discussion of vertical integration and concentration of control\(^8\) already has made clear the dominance of the petroleum industry by a few large and fully-integrated major oil companies. Vertical integration and technological mass production, especially in the refinery, require economic organizations of tremendous size with vast amounts of capital assets. The activities of these giant

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\(^7\) The term bureaucracy "may be applied in profit-making business or in charitable organizations, or in any number of other types of private enterprise serving ideal or material ends. It is equally applicable to political and to religious organizations." Weber, The Theory of Social and Economic Organization, p. 334.

The pure type of bureaucratic organization in which legal authority is exercised and a bureaucratic administrative staff is employed has the following criteria: a continuous organization of official functions delimited by administrative rules and regulations, in which official duties are defined, authority is made specific and limited by rules, and administrative officials are qualified and competent to exercise authority; there is a hierarchal arrangement of administrative offices, in which each office is subordinate to a higher authority; administrative officials do not own the means of production nor administration; there is no incumbent "right" to an office except technical training and ability rationally determined, that is, by tests, examinations, technical training; administrative acts, rules and regulations are recorded in writing and kept on file; authority may be exercised in a number of ways (for example, in monocratic administration, the purest form of bureaucracy, final authority is exercised by an individual; in the collegial type of administration, a qualified bureaucracy, decisions are by a vote of the body as a whole.). Cf. Ibid., pp. 329-333, and Essays in Sociology, pp. 196-198.

\(^8\) Supra, Part III, Chs. 3 and 4.
corporations involve operations of such wide range that administrative control from a single source of authority is economically impracticable. The integrated petroleum holding corporation, a consequence of finance capitalism, that owns or controls the operations of a number of subsidiary companies has precipitated a form of "decentralized management" which, in many respects, resembles the administrative staff organization of a bureaucracy.

Perhaps one of the clearest and simplest ways to show in what respects organization of management in the petroleum industry approximates that of bureaucratic administration is to select, for the purpose of illustration, the company most frequently identified with petroleum industry practices and policies: the Standard Oil Company (New Jersey), or as it will be referred to more often, the "Jersey Company", or "Jersey Standard". 9 Jersey Standard, a non-operating holding company with assets totalling almost three billion dollars, 10 owns the controlling stock interest in a number of subsidiary companies operating in every branch of the petroleum industry. 11 In theory, these relatively small subsidiaries

9 From the standpoint of assets, the Standard Oil Company (New Jersey) is the largest oil company. See Appendix, Tables 1 and 37.
10 For the year ending December 31, 1946, assets were reported to be $2,995,989,693. See Appendix, Table 37.
11 For a list of principal operating companies in which Standard Oil Company (New Jersey) holds the controlling interest, see Appendix, Table 38, Also, TNEC (Part 14-A), Appendix II, pp. 7885-8001.
are directly responsible to their respective boards of directors and officers, but in practice they usually reflect the general policies of the parent holding company.

Because many component parts of the integrated petroleum corporation are spread throughout a number of individual companies and dispersed over considerable geographical territory, a prime responsibility of management is the coordination of its diversified operations and the activities of thousands of workers engaged in numerous and varied occupations. Such coordination has been achieved rather successfully by the Jersey Company through a hierarchal organization of highly specialized and functional administrative offices.

The organizational chart of Jersey Standard presented below in Figure 4. shows the hierarchal arrangement of authority as represented by the various levels of the principal managerial positions. Considered to be "top management" of the Jersey Company is the board of directors which is elected at the annual meeting of the stockholders.12 Members of the

12 The board of directors consists of 11 members who elect the company officers. Six board members serve as officers: the chairman of the board, the president, four vice-presidents; non-board members officers are the comptroller, treasurer, and secretary. From Stenographic Report of Annual Meeting of Stockholders, published by the Standard Oil Company (New Jersey), June 3, 1947, p. 6.
board are employed full-time and receive an annual salary. They meet once a week, or upon call, and they have final authority on all matters relating to the general policies that affect the parent and subsidiary companies. Between regular meetings of the full board, an executive committee composed of five directors functions for the board and meets daily to coordinate all the various activities of the company.13

Despite the fact that the board of directors is designated by the Jersey Company as its top management, presumably because ultimate authority rests with the decisions of the board, such designation and criterion is not in strict accord with the concept of Max Weber. Theoretically, the administrative official in the pure type of bureaucracy is appointed because of his technical qualifications; he is not elected. His office becomes his chief occupation, the tenure of which is expected to be life-time, and he is separated from the means of production or administration.14

Neither the board of directors, the executive committee nor the officers of the corporation fulfill these requirements of the bureaucratic official. While the stock ownership of Jersey Standard is diffused among more than

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13 Loc. cit.
100,000 stockholders, the fact that the hundred largest stockholders who represent but an infinitesimal proportion (0.06%) of the stockholders own almost half (47%) of the outstanding voting stock\(^\text{15}\) implies domination of the Jersey Company by a select group. Undoubtedly either the board of directors are elected from the group of one hundred stockholders or the latter elect their chosen representatives; in either case, the board of directors are representative of financial or investment control rather than managerial control. As Moore points out, "the most obvious and most frequent method of domination of a corporation by financial 'control centers' is that of self-election or election of closely controlled representatives to executive and directorial positions."\(^\text{16}\) In other words, members of the board of directors are not appointed officials, nor are they very clearly divorced from the ownership of the corporation. Furthermore, tenure of office, although subject to continuance through annual re-election, is of fixed duration. Very frequently the members of the board of directors serve in similar capacities for one or more concerns and they do not consider this particular directorship their chief occupation. This is not unusual in the case of large corporations dominated by financial interests where directors may have little

\(^{15}\) Appendix, Table 10.

\(^{16}\) Moore, \textit{Industrial Relations and the Social Order}, p. 84.
or no knowledge or familiarity with the operations of the corporations they "direct". 17

Assisting the board of directors and executive committee is a group of advisors and consultants who, although outside the corporation, are "retained" by the Jersey Company because of their technical competence. 18 These specialists or experts have no functional authority in the sense that it is derived from their official position in the bureaucratic hierarchy. Their relationship to the organizational structure is of an advisory nature, and their "authority" or roles are "always limited to a particular 'field' of knowledge and skill." 19 Since authority in an administrative or bureaucratic hierarchy is determined in terms of the office which the bureaucratic official holds, these advisors and consultants cannot be considered members of the bureaucratic administrative staff, even though their advice and counsel may influence the decisions of the board of directors, and they may be paid a fixed "retaining fee".


18 Frank W. Pierce, a director of the Jersey Standard, in charge of employee relations, "Talking Things Over in an Organization", an address before the Summer Institute on Community Leadership, Syracuse University, July 15, 1946, p. 3.

19 Talcott Parsons, "The Professions and Social Structure", Social Forces, XVII (May 1939), 460-461.
FIGURE IV
ORGANIZATIONAL CHART OF LARGE HOLDING COMPANY IN PETROLEUM INDUSTRY

PARENT COMPANY
  STOCKHOLDERS
    ADVISORS
    DIRECTORS
    EXEC. COMM.

  OFFICERS

PUBLIC RELATION
LAW
MFG.
SALES
EMPLOYEE RELATIONS

COORDINATION COMMITTEE

SUBSIDARY
  STOCKHOLDERS
    DIRECTORS

  OFFICERS

PUBLIC RELATION
LAW
MFG.
SALES
EMPLOYEE RELATIONS

REFINERY GENERAL MGR.

PUBLIC RELATION
LAW
MFG.
SALES
EMPLOYEE RELATIONS

ASST. MGR.

DIV. SUPT.
DIV. SUPT.
DIV. SUPT.
DIV. SUPT.
DIV. SUPT.

DEPT. FOREMAN
DEPT. FOREMAN
DEPT. FOREMAN
DEPT. FOREMAN
DEPT. FOREMAN

SHIFT FORE.
SHIFT FORE.
Management Organizational Chart
(Figure 4.)

Since it would be impossible to attempt to draw any organizational chart that would include every operation, or every subsidiary, the chart here merely indicates the complexity of a large petroleum corporation even if only the lines of communication and authority are shown for only one department (manufacturing, or refining) and one subsidiary.

The parent organization (blue) is a general policy-making organization.

The activities of all subsidiaries of the parent company are coordinated by the Coordination Committee. Its membership is made up of parent company staff department heads and some of the executives from subsidiary companies. The Chairman of the Coordination Committee is a director of the parent company, and the committee has no responsibility for operations. Its primary purpose is long range planning, and to train executives in all phases of the business. It appoints sub-committees in marketing, producing, chemical products, refining, and so forth. These sub-committees have representatives of all the important operating subsidiaries in their particular field, together with the representatives from the various staff departments. The Coordination Committee is directly responsible to the board of directors.

The subsidiary (red) is also a general policy-making organization at the level of staff departments. Responsibility for operations is at the level of the refinery (green).

The refinery is simply a subdivision of the manufacturing staff department of the subsidiary. It is under the supervision of a general manager appointed by the board of directors of the subsidiary company.

The general manager coordinates the activities of non-operational departments which, because of the size of the refinery, have also been assigned to the refinery. These departments usually are the employee relations, law, public relations, traffic, accounting, and so forth.

Serving directly under the general manager and responsible for the refinery operations is the assistant general manager.

Refining operations are divided into a number of divisions each with its own superintendent.
The divisions are further sub-divided into operational departments, under the supervision of a general foreman.

Under the general foreman are one or more sections of his department each with its own shift foreman.

Source: Adapted from information in an address by F. W. Pierce, a director of Standard Oil Company (N.J.), "Talking Things Over in Management"; from the Annual Report for 1946 of Jersey Standard; from An Introduction to Standard Oil Company (New Jersey); and from Mr. W. B. Cotton, Manager of Public Relations, Esso-Standard Refinery, Baton Rouge, Louisi-ans.
Without more detailed information than is readily available concerning the appointment, qualifications, authority and duties of the managerial personnel of the Jersey Company, it is probably a safe assumption that administrative functions approximate those of the bureaucratic organization beginning at the level of departmental staff offices. At this level the responsibility for the various activities of the company are spread out horizontally into a number of staff departments (see Figure 4.): exploration, production, manufacturing, transportation, marketing, research, finance, law, accounting, medicine, employee-relations, and other departments which deal specifically with some aspect of the modern petroleum industry. Each department has its own manager who is responsible to an officer of the company, generally a vice-president who has jurisdiction over the activities of one or more staff departments. 20

Principally, the functions of staff departments are to coordinate similar activities throughout the various subsidiaries. For a corporation the size of Jersey Standard, it would be almost impossible to include in a single organizational chart every phase of the activities carried on as they are by a number of subsidiary companies. Even the attempt made in Figure 4. to follow the hierarchal arrangement only for one affiliate and for one department becomes

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20 An Introduction to Standard Oil Company (New Jersey), a pamphlet published by the company in 1947, pp. 19-20.
exceedingly complex.

The administrative organization of a subsidiary such as Esso-Standard Oil Company of New Jersey generally is patterned after that of the parent Jersey Company. It has its own board of directors, elected annually by the stockholders, and its own officers who are elected by the board. Usually the operations of a subsidiary will be concentrated in one or two branches of the industry; for example, Esso-Standard is principally engaged in refining and marketing activities. While the central office of the subsidiary is located in New York, along with those of the parent company, its refinery operations, in the case of Esso-Standard, are scattered over considerable geographical territory.21

21 In the case of Esso-Standard Oil Company of New Jersey where the parent Jersey Company owns 100% of the subsidiary company stock (and in other subsidiaries where the stock holdings of the parent company are considerable) the election of the board of directors and officers probably are mere formalities, and the members of the boards may be "selected" for election based upon their skill, training and experience. In other words, subsidiary company elections approximate that of direct appointments.

Esso-Standard "operates refineries at Bayonne and Linden, New Jersey, Baltimore, Maryland, and Baton Rouge, Louisiana, as well as smaller plants in Jersey City, New Jersey and Charleston, South Carolina. (The refinery at Baton Rouge is known as the Louisiana Division of the Manufacturing Department of Esso-Standard Oil of New Jersey, and is under the direct supervision of a Vice-president, Mr. Boyer who acts as general manager of the refinery.) It markets in New Jersey, Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Tennessee, Arkansas, Louisiana, and the District of Columbia. In addition, it owns Standard Oil Company of Pennsylvania, which markets exclusively in the Keystone State and operates a large grease-making plant in Pittsburgh, Pennsylvania. Another of the Esso-Standard subsidiaries is Penola Inc., marketer of industrial lubricants, process oils, and specialities." An Introduction to Standard Oil Company (M.J.), p. 13.
In a corporation so large and so formally organized as the Jersey Company, its system of coordinating its far-flung activities constitutes the basis of its social organization. "The essence of social interaction and a primary condition for the existence of any social group is to be found in communication. It is impossible to talk about a social relationship or social organization without implying the existence of communication among the several units (persons) said to be related or organized." The various units of the Jersey Company are coordinated through a complicated system of indirect communication and functional specialization. Each administrative official is assigned to, and is responsible for, a particular operation or activity of the corporate organization. The functional activities of the officials are vertically linked together in a chain of command by means of which authority is passed along from the higher to lower echelons in the managerial ranks.

One of the most important organizations of the Jersey Company is the Coordination Committee. This committee, composed of staff department heads and some executives from subsidiary companies, is directly responsible to the board of directors. It is under the chairmanship of a director of the Jersey Company who has no responsibilities for the operational functions of the company.

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22 Moore, Industrial Relations and the Social Order, pp. 112-113.
The primary purpose of the coordination committee is long-range planning. It appoints a number of subcommittees in marketing, refining, producing chemical products and so forth. In addition to long-range planning, these subcommittees serve the purpose of executive training and of keeping all departments and subsidiary companies aware of recent developments within and without their particular fields of direct interest.

On these committees are included all important operating companies representing their particular branches of petroleum industry activity. It is at this level of management that the activities of all subsidiary companies are coordinated. "If one affiliate develops a new and more efficient method for finding, producing, or refining oil, it is quickly made available to others. If a new accounting system proves superior in one company, it is brought to the attention of all the affiliates. In the development of markets, in decisions to expand producing or refining operations, in contacts with the rest of the industry, in matters of employee relations, in forecasting future trends, in these and many other ways the exchange of information among managers of the Jersey group is promoted and assists in the coordination of their activities, thus enhancing the efficiency of all." 23

Through membership on the coordination subcommittees, the Jersey Company provides a practical training program for potential executives. Members are encouraged to speak freely, to present and to defend their own ideas, and to criticize severely ideas and projects submitted by others. This practice permits some relaxation of the usual rigid rules of formal procedure in order to stimulate lower levels of management to develop initiative, and also because "frequently the dissenters produce the most important results, and proposals made at these meetings are often thrown back to other groups for further study because of the analytical questions asked."\textsuperscript{24}

The hierarchal organization of authority is illustrated by the following hypothetical case where a marketing subsidiary presents a project for the erection of a bulk plant.\textsuperscript{25} The plan, first of all, will be drawn up and discussed by the wholesale marketing division (similar to the petroleum products division of manufacturing in Figure 4.), and then presented to the marketing department. Approved by the marketing department it is then presented at the weekly meeting of the plant management committee which is presided over by the general manager. If the project is deemed of significant importance, it will then be referred to the

\textsuperscript{24} Pierce, op. cit., p. 5.

\textsuperscript{25} The following example adapted from Pierce, op. cit., pp. 5-6.
marketing sub-committee of the coordination committee where everyone concerned with marketing will have an opportunity to criticize the project. Discussion would include the cost of the plant in terms of unit-cost per barrel, the advantages of the proposed location, and also such problems as the relative costs of water versus land transportation and the question of design.

Once these questions and problems are satisfactorily answered and agreed upon, the project then would be submitted to the full coordination committee. All details of the project will again be checked, but at this meeting representatives from all phases of the business are present, not simply those concerned with marketing. Producers, refiners, transportation men, and people from the budget and financial departments are given an opportunity to cross-check the effect of the proposed project on their particular phases of the business. If the project should survive this discussion by the coordination committee, it would then be submitted to the board of directors for "general policy and financial check, including its effect on employee, public and government relations. Any project which gets by these three screens has a reasonable chance of being sound in the overall interest."26

26 Loc. cit.
Throughout this typical procedure, one of its outstanding features is the use of the "conference technique". Combined with the effective administrative hierarchical organization, this technique often is the cause of complaints about "too many meetings, wasting time in meetings, too talkative participants ... Some of the wags refer to our company as the 'Standard Meeting Company', which perhaps, tells its own story of the extent to which we are using the conference method for both training and coordination." 27 This process, while it permits consideration of many facts, including some that are unimportant and irrelevant, before a decision is reached, also divides and limits personal responsibility. In this type of "collegial" bureaucratic administration the amount of authority vested in an individual is greatly lessened and thus is a deviation from the pure type of "monocratic" bureaucracy. 28 The role of the individual, regardless of his ability and knowledge, tends to become ineffectual without the backing of most of his colleagues since decisions to accept or reject a given proposal

27 Ibid., p. 8.

28 The principle of collegiality takes several forms — as contrasted with the monocratic type of administrative authority. Here the reference is to the collegial type where decisions of officials "are carried out only after previous consultation and a vote. That is, their acts are subject to the rule that a plurality of individuals must co-operate for the act to be valid. This co-operation may follow the principle of unanimity or of decision of majority." Weber, The Theory of Social and Economic Organization, p. 393.
or idea rests upon majority decisions by the successive hierarchical administrative authorities. A weakness of collegial administration from the viewpoint of bureaucratic organization is that it permits the intrusion of irrationality. While the conference technique may promote objectivity and integrity through a system of checks and balances that arises from a free discussion, it may also result in an inferior proposal being accepted in that a situation may easily be created where conflicting personalities rather than the respective merits of considered proposals may determine the outcome of a vote. This would not occur in the pure bureaucratic organization where the exercise of authority is characteristically rational and based upon knowledge and ability. 29

Another important characteristic of bureaucratic administration is the recruitment, and training and promotion of managerial personnel. In the pure type of bureaucracy, officials are selected on the basis of technical qualifications that are determined rationally by means of examinations or "by a diploma certifying technical training", or by both. 30 The office of the bureaucratic official becomes his principal career and his promotions, "according to seniority or to achievement", are "dependent on the judgment of superiors". 31

29 Ibid., p. 339.
30 Ibid., p. 333.
31 Ibid., p. 334.
These characteristics of the bureaucratic official probably are applicable only to a limited extent to the managerial personnel in the petroleum industry today. It has already been pointed out that the board of directors, which the Jersey Company recognizes as its "top management", cannot be included within the concept of bureaucratic officials.

Formerly when knowledge of petroleum operations was gained from long years of experience in the business, the Jersey Company promoted many of its managerial personnel from within its ranks. To some extent this may still be true, particularly with regard to the recruitment of managerial personnel associated with operational functions; that is, plant superintendents, general foremen, and shift foremen frequently may be appointed from the ranks of labor.

However, as was shown in the preceding chapter on occupational characteristics, recent advances in the scientific and technological aspects of the petroleum industry have increased the need for more technical skills and knowledge, and have resulted in some modification of the seniority principle in promotion policies.

32 This practice is true not only of Jersey Standard but apparently so for the oil companies throughout the industry. Mr. Russel Hogen, of the Department of Information for the American Petroleum Institute, in a letter to the author, May 4, 1948, wrote: "I believe I am personally acquainted with the vast majority of the responsible executives of the major oil companies of the country and many of the minor ones, and I know of no man in such a position who did not come from within the industry."
The science and technology of the modern petroleum industry have also created a far greater demand for personnel with professional training compared with the employment of such persons during the earlier years of the industry when ownership and management were closely associated with each other. As a consequence, the trend has been toward a greater use of "technical specialists". This trend, together with the growth of the large petroleum corporation and the gradual lessening of ownership control by individual or small groups of stockholders, has resulted in the petroleum economic organization assuming some of the characteristics of a bureaucratic organization.

Professionally trained persons at first were inducted into the industry primarily to increase the effectiveness and efficiency of technical operations, with perhaps little consideration given to them as a source of potential managerial personnel. Their primary functions were to improve and to maintain petroleum operations at a high level of efficiency through technical research and advice to management. While the largest proportion of technical specialists employed by the petroleum industry today is probably still performing these functions, the number of persons professionally trained in chemistry, physics, engineering and research are being supplemented in large numbers by other professional personnel trained in the fields of law, accounting, statistics,
public relations, employee-relations and so forth. One major result of the growth of this specialized professional group has been to slow down considerably the transition of personnel from the ranks of labor into managerial positions. In all probability, it will be even more difficult to make such a transition in the future unless, of course, there is some radical change in petroleum operations that will stimulate an expansion program comparable to that of past two decades.

The growth of the professional group now entering the petroleum industry at a level somewhere closer to management than to labor has been so rapid and is of such recent origin that its relationship to the bureaucratic administrative staff is only now beginning to be recognized. The roles of the professional group are gradually expanding to include other than merely research and advisory functions; they are having more administrative responsibility and authority delegated to them. The importance of technically trained professional personnel in managerial functions, not only in the petroleum industry but throughout American industrial society, has led to a considerable amount of literature concerning "professional" or "scientific" management.33

It is very likely that it will be from this growing group of professional personnel that future petroleum executives may be expected to be selected after they have obtained a required apprenticeship in the practical aspects of the petroleum business.  

Indications of this trend already are apparent in the recent innovations among the major oil companies to establish special training programs for potential executives. The Jersey Company, for example, established this type of program in 1945. Under this program, and at the expense of the company, promising employees are selected to attend a special three-month course in advanced management at Harvard University. This executive training program is designed "to add to the strength of the organization by developing men and women of initiative and promise for key positions with Jersey Standard and its affiliates in the years ahead."  

In much the same manner in which higher technical and administrative personnel are being developed through specialized training programs, first line supervisors and foremen are also being developed. Formerly, in the absence of a rational system for selecting supervisors and foremen

34 "The continuing technical knowledge required these days to operate in the petroleum field demands that its executive have had thorough training within the ranks." Hogen, op. cit.

based upon qualifications determined by examinations, first line supervisors were promoted from the ranks of labor mainly because of their long years of experience with the company. Today, such selections are becoming less dependent upon trial and error methods and greater reliance is placed upon a more rational, systematic program of training. Perhaps nowhere in the petroleum industry is this more evident than in the personnel department to which has been delegated the responsibility of handling the dynamic problems of human relations.

Under the supervision of a technically trained staff, personnel management in the Jersey Company has now developed into a highly specialized activity involving every level of management from the first line foreman of the operating subsidiary to the manager of the parent company staff department that is directly under the supervision of a member of the board of directors. Its functions now include the selection, placement, and on-the-job training of personnel; job evaluation, training and developing leadership qualities among supervisory employees, and, of increasing importance,

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36 Since 1945 Mr. Ralph Mason has been manager of the Personnel Department in charge of industrial relations; he succeeded Mr. F. W. Pierce who is now a Jersey Company director. The latter was manager of personnel department from 1933 when he succeeded the first manager, Clarence J. Hicks. *Fortune* (November 1946), 177.
the responsibility for employee relations.\textsuperscript{37}

In the early years of the industry, personnel management was concerned almost solely with problems of labor recruitment, but even this function was performed in a rather haphazard manner. "Hiring men in 'the good old days' was a hit-or-miss operation. The job hunters queued up at the gate and the superintendent picked as many likely looking candidates as he needed."\textsuperscript{38} Job security for the worker rested entirely within the authority of the foreman or superintendent who hired and fired for whatever seemed justifiable reasons to them.

With the growth of the industry and the increased use of mechanical equipment, emphasis was placed upon developing a more efficient labor force. In order to insure the fullest productive capacity of mechanized equipment, the selection and training of labor received greater attention. Personnel management was removed from the line supervisor and delegated to a staff department under the direction of specially trained personnel familiar with interviewing techniques, testing and measuring job performance.

Under conditions of mass production, especially in

\textsuperscript{37} F. P. Hagaman, Asst. Executive Comptroller of Esso-Standard, Class Discussion in Personnel Management, Louisiana State University, December 10, 1947.

\textsuperscript{38} Stuart Chase, \textit{A Generation of Industrial Peace}, p. 9.
the refinery where continuous operations are essential, not only efficient job performance is important, but it is also essential that labor turnover be kept at a minimum. To accomplish this goal, the Jersey Company not only has established in-plant training programs, but in the first years of this century it initiated a program of annuities and benefits with the responsibility for its administration delegated to the personnel administration staff. Old-age retirement plans were established in 1903, a series of thrift plans were inaugurated in 1909, group insurance, and accident and health plans were first put into operation in 1915, and death benefits to employees' families were instituted during 1918.

One of the most important functions of personnel management today in Jersey Standard is the responsibility

39 Membership in the Employee Thrift Plan included approximately 40,000 men and women, or about 95% of the regular employees of Standard Oil Company (N.J.) and its participating affiliates. Employees owned 121,443 share of stock in Jersey Standard costing $6,180,177.03 (employees may purchase stock at cost), and the total assets of the thrift fund amounted to $46,401,894.51 Twelfth Annual Report Employees Thrift Plan Standard Oil Company (New Jersey) and its Participating Affiliates, June 30, 1947.

which it has for industrial relations, or, as the company
calls them, employee relations. As originally formulated
and developed, following the disastrous experiences of
1911-1916 in company controlled subsidiaries, the employee
representation plan initiated by the employee relations di-
vision over the objections of John D. Rockefeller was not
designed for the purpose of collective bargaining. The "Plan"
was originated, controlled and subsidized by the company;
its rules and regulations were formulated by management,
and final decisions concerning any grievance were made by
management without the due process of collective bargaining.

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41 On April 20, 1914, state militia fired into a group
of tents occupied by strikers and their families who had been
evicted from company houses, and not only were strikers killed
but also their wives and children; some twenty-one persons were
killed. "Throughout the nation people were horrified at the
tragedy, among them John D. Rockefeller, Jr., whose family
owned a large block of stock in the Colorado Fuel and Iron
Company" against whom the workers were on strike at the time
of the "Ludlow Massacre". Chase, A Generation of Industrial
Peace, pp. 6-7. The other experience was in 1915 and 1916 at
the Bayonne refinery in New Jersey. Refusal by the general
superintendent to see the workers precipitated a riot in
which "fires were set, tank cars of oil, box cars of merchandise,
a company pump house went up in flames....next year it broke out
again...the police were hastily summoned as before. There was
another fight, some say worse than the first, and more men went
to the hospital and cemetery." Ibid., pp. 3-4.

42 "I have watched and studied the trade unions for many
years. My ideas about them are not those held by some others.
But my son will see; others will see; things change, but men
change very little. It is hard to understand why men will organ-
ize to destroy the very firms or companies that are giving them
the chance to live and thrive, but they do it...Soon the real
object of their organizing shows itself - to do as little as
possible for the greatest possible pay." Alan Nevins, John D.
Rockefeller; The Heroic Age of American Enterprise (New York;

The "Plan" was conceived by management as a device to controvert future labor disturbances, and until it was abandoned by court order in 1937\(^\text{44}\) it successfully performed its function. "Since that time in October 1916, however, about thirty years ago, there has been no violence, and only a few local work stoppages in Jersey Standard.\(^\text{45}\)

While the employee representation plan, or so-called company union, represented little more than a gesture on the part of management, it nevertheless made it incumbent upon management to go through with the formality of meeting with representatives of labor to "talk over" problems formerly considered the sole prerogative of management to decide. In most instances complaints of labor were settled by the foreman, or by the superintendent of the division in which the complaint was made. To a large extent this is still the practice of the Jersey Company as will be seen in the following chapter in which the organizations of labor will be discussed more fully.

Perhaps the most significant feature of the employee

\(^{44}\) A decision of the U.S. Supreme Court in 1937 held that company unions were not bona fide agencies for collective bargaining, and "the management of Jersey Standard announced that the Plan could not continue." \textit{Ibid.}, p. 23.

\(^{45}\) The largest strike since 1916 was that of about 1,000 seamen operating tankers in 1939; it lasted two months. \textit{Ibid.}, p. 5.
representation plan was the additional responsibility placed upon the first line supervisors: the foreman, general foreman, and the division superintendent. Heretofore their primary functions were those concerned with job supervision; that is, to give workers their assignments, to see that they understood and performed their work efficiently, to dismiss or to recommend for dismissal those workers they felt were unqualified, and to pass on to the workers the orders and directives received from higher levels of management.

However, with labor given the opportunity of expressing dissatisfaction about conditions that might have little to do with job performance, the role of the foreman assumed more and more that of an arbitrator, and of a "middle man" between higher management levels and labor. Too many complaints from labor would be very apt to bring criticism upon the foreman, since his decisions now were subject to review by the general foreman and superintendent, and in some instances might reach even higher echelons. Although the foreman in all probability was promoted from the ranks of labor because of his ability to handle men, his practical training and long years of experience, there was no assurance that such skill would enable him to handle other problems and questions raised by labor. It was for that reason that Jersey Standard began a program of foreman training in the very early stages of its employee representation plan, for it was
at this level that labor had its most direct contact with
management, and a mishandling of the dynamic relationships
between the foreman and labor could very easily have dis­
rupted the entire plan.

During the first conferences between labor and man­
agement it was soon discovered that "foremen and managers
were poorly equipped to deal with many of the questions raised
by the men." A program of foreman training was adopted
in 1918 that has continued to the present time. The object­
ives of this program are to provide the foreman with an op­
portunity to improve his technical skill and knowledge and
also to teach him how to handle problems of labor that, under
terms of the agreement between management and labor, must
first come to him.

Recently the increased activity on the part of Oil
Workers International Union to organize Jersey Standard plants
has resulted in an acceleration and expansion of the foreman
training program. Foreman conferences "have greatly increased

46 Pierce, op. cit., p. 7.
47 See "Grievance Procedure", Independent Industrial
Workers Association Agreement, p. 8.
48 "In 1942 the Oil Workers International Union, CIO, 
turned its attention to the refineries of Standard in New Jer­
ssey and organized some of the men." Complaint was filed with
the Labor Relations Board which ordered the independent unions
at Bayonne and Bayway dissolved, and when the Independent
Union appealed to the Courts, the decision of the Labor Board
was upheld. Chase, A Generation of Industrial Peace, p. 24.
in the past few years", and in the Fall of 1946 the major subsidiary of Jersey Standard, the Esso-Standard Oil Company of New Jersey opened the Esso Training Center at Elizabeth, New Jersey. The facilities of this training center are available to all Jersey Standard subsidiaries and it employs "a staff of 19 full-time and 11 part-time teachers (to) conduct courses ranging from evening 'refresher' sessions to eight weeks of study."

There are many types of training courses offered by the Center, but "the course called Basics of Supervision is in many ways the most interesting and significant ... The effort spent on this course and the fact that foremen are taken off the job for two weeks to attend it are evidence of the company's conviction that no group of employees is more important to operating efficiency or to sound employee relations than its first-line supervisors." Selection of foremen to attend is controlled by the management in each company unit, and presumably is mandatory.

49 Pierce, op. cit., p. 7.
52 Selection of students is controlled by management, and the fact that inquiries have been received concerning "voluntary enrollment" and that one foreman is quoted, "I've been a foreman, off and on, for five years. When they told me they were sending me to school, I raised plenty of hell," indicate foremen are required to attend the school. Ibid., pp. 31, 29.
The Basics course is divided into three phases. First the foreman is oriented "away from" labor of which he formerly was a member and he is taught to "understand his changed relationship to both workers and management, and to see himself as a member of a management team, to understand the nature of his new responsibilities, to learn to work with ideas instead of tools." In the second phase of this course, the foreman is taught how to organize his daily work, how to delegate routine jobs, how to train new workers, and "how to issue orders and insure that they are followed. How to handle grievances, settle disputes, preserve discipline." The third phase of this training is concerned with interpretation of company rules and regulations from the point of view of the supervisor. "Company policies and union contracts furnish most of the material, covering grievance procedures, new employees, transfers, terminations, leaves of absence, seniority, hours, working conditions, overtime rules, pay rates, vacations, accidents and sickness."

Thus, in addition to the special executive training given to promising professional and technically trained employees, Jersey Standard has embarked on a program of providing for a well trained and indoctrinated group of first.

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53 Ibid., p. 30.
54 Loc. cit.
55 Loc. cit.
line supervisors. It appears to mark the beginning of an accelerated program of bureaucratic training in the petroleum industry and presages the day when management below the "top management" of the board of directors will have to qualify themselves for their positions, and that promotions to higher levels of management will be determined upon the training and ability of the prospective management official. "Basics of Supervisions will eventually be given, with appropriate modifications, to new supervisors or potential supervisors in all departments of the company."56

These programs of training are designed not only to provide a trained labor pool for future management, but it is obvious from the content of the courses that much time is devoted to the preparation and training of management in the organization and handling of employee relations. In the succeeding chapter attention will be given to the manner in which labor has organized to meet with management and to bargain collectively.

56 Loc. cit.
CHAPTER 9

LABOR ORGANIZATIONS IN THE PETROLEUM INDUSTRY

Every aspect of the social organization of the petroleum industry presented in each of the preceding chapters has contributed in some measure to the background material necessary for understanding the system of human relationships that has developed from the social interaction between management and labor. The significance of this system of human relationships, often referred to as industrial relations, is associated with the manner in which the human factor of labor is organized.

Perhaps nothing has so influenced the character of the organization of industrial relations in the petroleum industry as the policies and practices of its largest and most powerful corporation, the Standard Oil Company (New Jersey). Traditionally, even after the dissolution of the Standard Trust, the industry has followed the lead of the Standard Oil Company. The dismemberment of the Trust did very little to destroy its influence but served merely to diffuse through numerous concerns the attitudes and beliefs which John D. Rockefeller, Sr., and his associates had so thoroughly instilled throughout their monopolistic Trust. John D. Rockefeller, Sr., a firm believer in economic individualism, was never completely reconciled to the fact that
the order, efficiency and standardized low prices made possible by the Trust did not justify the ruthless means employed to achieve them. He was uncompromisingly and unalterably opposed to any form of labor organization, and it was his firm belief that the action of his son John D. Rockefeller, Jr., in sponsoring an employee-representation plan would sooner or later be regretted.¹

Just as the disorganized conditions of the petroleum industry in the 1870's were propitious for the organizational genius of Rockefeller, Sr., to establish his successful monopoly of the industry, so too were the unstable conditions that obtained during the second decade of the twentieth century favorable for the establishment of the company union or employee-representation plan of Rockefeller, Jr. Labor difficulties had risen sharply as a consequence of the demand for labor by war industries in the face of a short supply of labor. With no central agency established for the allocation of the labor supply, and with the costs of living steadily rising, the trade union movement in the United States resorted to a number of strikes in order to press its demands for higher wages and union recognition.² It was then that

¹Alan Nevins, op. cit., p. 675.
war industries were required by the National War Labor Board to introduce some form of works council\(^3\) under the terms of which shop committees were to be set up for the purpose of preventing strikes and lockouts during the war, and the rights of labor and management to organize trade unions and employer associations were recognised in order to bargain collectively through their chosen representatives.\(^4\)

Along with the development of works councils and employee-representation plans, this period was also characterized by the attempts of "scientific management"\(^5\) to solve the problem of increasing human efficiency through adjusting the worker to the mechanical nature of his job. Time- and motion studies eventually resulted in a re-evaluation of the role of the human factor that led to a new philosophy of personnel management. The basic principle of this philosophy was that goodwill and a cooperative spirit between management and labor were invaluable assets to the production process; that when workers were given an opportunity to discuss their grievances they tended to work better, remain longer on their

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\(^4\) Ibid., p. 31. Typical of employers' associations were the National Industrial Conference Board, American Manufacturers Association, and the National Association of Manufacturers.

\(^5\) Frederick W. Taylor, Scientific Management. Cf. Supra, Chapter 1, f.n. 40.
jobs, and were less likely to seek membership in a trade union.  

Historically, however, the early consideration of labor as a human factor in industry, in contrast to its consideration merely as an economic factor of production, most frequently was "due to the pressure of trade-union activity, either in the form of organization drives or strikes in the trade or vicinity." Such was the situation with respect to the organization of industrial relations in the petroleum industry. Curiously enough, the first employee-representation plan adopted in the petroleum industry was very similar to that previously introduced into the mining industry. In both instances, the plans were introduced as the result of violent labor conflicts in concerns controlled by Rockefeller interests.

Just prior to the entrance of the United States into World War I, one of the bitterest, bloodiest and most merciless conflicts in the history of American labor took place on the property of the Colorado Fuel and Iron Company, a company in which John D. Rockefeller was the principal stockholder. The "Ludlow Massacre" occurred in 1913-1914 because

8 Report on the Colorado Coal Strike (Vols. I, II), Hearings before a Subcommittee of the Committee on Mines (Cont.)
of the refusal on the part of the mine operators to recognize the United Mine Workers union as the bargaining agent of the Colorado miners. Coming as the strike did, at a time when public opinion was still incensed over the monopolistic practices of his father's Standard Trust which had been dissolved in 1911, young Rockefeller, Jr., immediately called upon Mackenzie King, then Minister of Labor and later Premier of Canada, for assistance in developing a plan by which the miners would have an opportunity to express their grievances. It is significant that rather than to recognize the United Mine Workers Union and to work out a bargaining procedure with its representatives, Rockefeller, Jr., called upon Mr. King who had had experience with the Whitley councils developed in England. The plan suggested by Mr. King was submitted to the miners for their approval and was adopted by them in 1915 with only 57 per cent of the miners voting and with no alternative, such as United Mine Workers union, being presented. The plan provided for joint departmental committees composed of equal representation from management and


labor for the purpose of discussing matters pertaining to wages, safety, sanitation, health and housing, and recreation and education. In the case of a grievance, a procedure was provided for the employee or his representative to take his case through various stages to the president of the company, and if not satisfactorily settled, to submit the case to an arbitration board.\(^{11}\) This plan which became the model for the later employee-representation plans of the Standard Oil Company (New Jersey) and the Standard Oil Company of Indiana "was not considered a form of 'collective bargaining' as much as a form of 'collective dealing'."\(^{12}\)

Even before the Rockefeller employee-representation plan had been adopted by the Colorado miners, the Standard Oil Company (New Jersey) refinery at Bayonne, New Jersey, owned and controlled by Rockefeller interests, became embroiled in a serious labor conflict. While not as dastardly as that in Colorado, the strike was accompanied by violence, bloodshed and the intervention of the state militia.\(^{13}\) The company steadfastly refused to bargain with the workers and although the strike was broken, the truce between management and labor ended the following year (1916) in another outbreak that cost the lives of additional workers. It was then that an employee-representation plan similar to the one


\(^{12}\) Hicks, op. cit., p. 79.

\(^{13}\) Chase, Generation of Industrial Peace, p. 3.
adopted by the Colorado Fuel and Iron Company was presented to the workers of the Bayonne refinery for their acceptance. This plan, with modifications made in accordance with federal legislation and court decisions, spread throughout the industry. Despite the inroads made by organized labor upon many of the larger oil companies in the petroleum industry, the modified employee-representation plan still remains in effect in Standard Oil Company (New Jersey) and most of its subsidiaries, and in the largest units of the Standard Oil Company of Indiana. Thus, the organization of labor in the petroleum industry is principally of two types: the industrial trade union and the so-called independent industrial association.

Generally speaking, unionization in the petroleum industry is usually found in the larger companies. In the petroleum production branch, which has a large number of small concerns, less than five per cent of the companies are unionized, while almost one-half of the comparatively few but larger concerns in the refining branch are unionized. Although the percentage of union concerns is relatively small, about thirty-five per cent of the workers in the petroleum production branch are under union agreements, and the corresponding figure for petroleum refining is about seventy per

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14 Brown and Randle, op. cit., p. 20.
of the three major types of union organization—
craft, industrial, and independent—the largest in membership is the industrial union, the Oil Workers International Union (CIO) which has agreements covering about 60 per cent of all union members; the American Federation of Labor unions have about five per cent; and the various kinds of independent organizations have thirty-five per cent. Since the Oil Workers International Union is the largest single union organization in the petroleum industry, and the various independent associations represent the second largest group of union workers, attention will be given particularly to the structure and functions of these two labor organizations.

Industrial organization of the petroleum industry on a fairly extensive scale is a development only of the past ten or fifteen years. Organization of the petroleum workers first began about 1917 with the formation of the International


Plate XXIII

The Modern Refinery: A Maze of Pipes and Stills

Chemical Products Division
Esso–Standard Refinery, Baton Rouge, Louisiana

Photo by Rosskam
Association of Oil Field, Gas Well and Refinery Workers of America, an affiliate of the American Federation of Labor. Its organization came at a time when membership in trade unions throughout the country was climbing steadily, and by 1921 the membership in the petroleum union had reached its peak of 24,800, which was not attained again until 1934. During the years 1923-1929, largely because of business expansion and prosperity, and again because of the depression years of 1930-1932 that followed, the labor union movement in the petroleum industry continued to decline until it had become almost dormant in 1932.17

With the passage of the National Industrial Recovery Act in June of 1933, and under the provisions of Section 7(a) of the Act18 a renewed effort was made on the part of the

17 Membership in the International Oil Field, Gas Well and Refinery Workers of America was 24,800 in 1921; 12,000 in 1925; 10,000 in 1928; 4,000 in 1932; and 39,700 in 1934. Cf. Lee Wolman, Ebb and Flow in Trade Unionism (New York: National Bureau of Economic Research, 1936), Appendix Table I, pp. 172-3.

18 Section 7(a) of the National Industrial Recovery Act provided that: "Every code of fair competition, agreement and license approved, prescribed or issued under this title, shall contain the following conditions: (1) That employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint or coercion of employers of labor, or their agents, in the designation of such representatives whether in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection. (2) That no employee and no one seeking employment shall be required, as a condition of employment, to join any company union or refrain from joining, organizing, or assisting a labor organization of his own choosing." cited in Characteristics of Company Unions, 1935, p. 225.
International Association of Oil Field, Gas Well and Refinery Workers to increase its membership, and by 1935 the union had 43,500 members.\(^{19}\) When the Congress of Industrial Organization was organized in 1935, the petroleum workers left the AF of L to become a charter member of the C.I.O., and in 1937 the union changed its name to the Oil Workers International Union. While there are a number of operating and maintenance workers in the petroleum industry who are covered by agreements of the International Union of Operating Engineers, and other smaller locals of the American Federation of Labor,\(^{20}\) these union agreements covered less than five percent of the organized workers in the petroleum industry in

\(^{19}\)Wolman, op. cit., p. xii.

\(^{20}\)For example, the Shell Oil Company (Wood River, Illinois) has agreements with the metal trades unions covering operating and maintenance employees as well as with the International Union of Operating Engineers for operating employees and with an A. F. of L. federal labor union covering guards and watchmen. Cf. Marquardt, op. cit., n. 1, p. 2. At the Cities Service Refinery (Lake Charles, Louisiana), the A. F. of L. Metal Trades Council is the recognized bargaining agency. Usually, the Metal Trades Council would include only metal trades unions, and other craft unions such as carpenters, painters, electricians, etc., would be included in the Building Trades Council. However, all the craft unions (of) the Cities Service Refinery are affiliated with the Metal Trades Council. This is atypical of the A. F. of L. but it is a device which avoids having numerous agreements with one company, and approaches an "amalgamated" union for the purpose of bargaining collectively with an industrial concern that is vertically integrated.
Today, the Oil Workers International Union (O. I. O.) has a membership of between 90,000 and 100,000; it has seven regional districts comprising almost 200 local unions, and its agreements with petroleum companies and plants cover more than 130,000 workers.22

The second largest group of organized workers in the petroleum industry belongs to the so-called independent associations. The organization of these independent organizations, which were a direct outgrowth of the earlier employee-representation plans introduced to the petroleum industry by the Standard Oil Company (New Jersey), were patterned after the Rockefeller Colorado industrial plan. It is very significant that almost alone of the larger petroleum corporations, the Jersey Company has successfully resisted the efforts of outside unions to organize its workers, and any changes in the original employee-representation plans have been made only at the insistence of legislation and court orders.

In view of the antagonistic attitude expressed by John D. Rockefeller, Sr. toward labor unions, and the refinery strikes of 1915-1916 at the Jersey refinery in Bayonne, New Jersey, it was not surprising that the Standard Oil

21 Marquardt, op. cit., p. 2.
22 Information obtained from local headquarters of Oil Workers International Union in Baton Rouge, Louisiana.
organized an employee representation plan in order to quell labor unrest and forestall organization by outside unions. Clarence J. Hicks, who had assisted in the organization of the employee representation plan at the Colorado Fuel and Iron Company, was appointed executive assistant to Mr. A. C. Bedford, president of the Jersey Company, with the responsibility of working out a similar plan for the refinery at Bayonne, New Jersey.

The plan as eventually submitted to the workers was worked out by Mr. Hicks without any consultation with the workers, but was submitted to the board of directors of the Jersey Company for their approval. Upon unanimous acceptance by the board, "the first step in the industrial relations program was to offer the wage earners an opportunity

23 A position he held under successive administrations until his retirement in 1933. "...I prefer as a rule the title 'Executive Assistant to the President' rather than the title of an executive officer, since the former emphasizes the fact that the operating head of the company recognizes his continuing responsibility for all employer-employee relations, while the latter may lead employees to feel that responsibility for the general business of the company will outweigh interest in the employees and their problems." Hicks, op. cit., pp. 52, 125.
to elect representatives," on ballots handed to them as they reported to work. It was not until four years later, in 1922, that a statement of the labor policy of the Standard Oil Company was printed and distributed to all its employees. The method of initiating the employee-representation plan is rather significant in view of the fact that many of the essential features of the original plan are still embodied in the current agreements effective between the Jersey Company and the employee associations in the departments and plants of its subsidiaries. A semi-official publication widely distributed by the Jersey Company states, "The 1918 agreement was a kind of Magna Charta for Jersey's employees, foremen and top management. Its spirit still broods

24 Ibid., p. 54. Stuart Chase in his Generation of Industrial Peace written for Standard Oil Company (New Jersey) begs the question when he writes "So Mr. Hicks and his colleagues had to devise a self-contained constitution which would give workers a strong union to fall back upon, for there was no such outside union in sight." (Italics are Mr. Chase's.) In terms of present day mass production and vertical-integrated corporations, it is undoubtedly true the International Oil Field, Gas Well and Refinery Workers of American union of 1918 was not structurally competent, but this hardly justifies the argument of Mr. Chase for a company union because there was no outside union. Cf. pp. 9, 18.


26 Hicks, op. cit., p. 55.
over the contracts negotiated in 1946. The basic provisions appear and reappear throughout thirty years of peace."27

Since the inception of the employee representation plan at the Bayonne refinery in 1918 until 1937 there were very few, if any, changes in the original plan. It was adopted in many of the departments and plants in the Jersey Company and its subsidiaries; whereas the American Federation of Labor trade union of Oil Field, Gas Well and Refinery Workers had all but disappeared by 1932, the Jersey Company alone had installed more than forty of its employee representation plans.28 Following the decision of the United States Supreme Court in April of 1937 upholding the constitutionality of the National Labor Relations Act "to the extent that the activities of employers in the formation, control, or domination of 'company unions' interfere with the rights of labor to organize and bargain collectively, and insofar as such activities constitute unfair labor practices within the meaning of the National Labor Relations Act, such unions are outlawed",29 the employee-representation plans of the Jersey Company were reorganized into employee associations that were free of financial support and domination by

27 Chase, Generation of Industrial Peace, pp. 16-17.
28 Ibid., p. 19.
the company.

Although the newly formed employee associations were governed by their own constitutions and an agreement was signed between the associations and the various Jersey departments and plants, the Oil Workers International Union went before the National Labor Relations Board with the complaint that these associations were in fact not independent. The decision of the National Labor Relations Board that the associations were to be dissolved was taken to the Federal Circuit Court by the Jersey Company, who lost its case. As a result a new form of independent industrial workers' associations was established and finally certified by the National Labor Relations Board. 30

In 1940 the Jersey Company had agreements with fifty-five independent locals covering 35,884 or ninety-eight percent of the company's 36,722 workers eligible for union membership. 31 Because the several agreements now in effect between the independent industrial associations and the Jersey Company and its subsidiaries are identical in many respects, with minor variations in the name of the association and constitution, 32 the agreement between the Industrial Workers'

31 Ibid., p. 27.
32 In the Standard Oil refinery at Bayway, New Jersey, the workers' organization is the Independent Petroleum Workers Association. Ibid., p. 38.
Association and the Esso-Standard refinery at Baton Rouge, Louisiana may serve as a model for the following discussion.  

Primarily, the function of a labor union is to increase the relative economic position of the workers through the process of collective bargaining. With the growth of the large vertically-integrated petroleum corporation and its reliance upon mass production, the modern petroleum labor organization has also become a highly developed and complex social group. As a result, a general pattern of industrial relations has been established in almost all of the larger petroleum corporations which are unionized. The earlier form of individual bargaining has completely disappeared and in its place labor -- organized into the large, single industrial union representing all or the majority of eligible employees -- and management of the giant petroleum corporations have entered into collective agreements covering almost every phase of the industrial life of labor. One outstanding exception, of course, is the Standard Oil Company (New Jersey).

Theoretically, collective bargaining presupposes the existence of a labor organization entirely independent of

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33 Constitution and By-laws of the Independent Industrial Workers' Association of Baton Rouge, Louisiana, 1947, and the Agreement (as of June 23, 1947) Between Standard Oil Company of New Jersey, Louisiana Division, Manufacturing Department, Baton Rouge Refinery and Independent Industrial Workers' Association. These sources will hereinafter be referred to as ITWA Constitution and the ITWA Agreement.
management, but it is singular, in the case of the Jersey Company, that it has been able to resist every effort on the part of "outside" labor groups to organize its workers. It continues to deal individually with a number of independent workers associations. The membership of these associations usually consists of the eligible employees in a particular plant, department, or company of the parent organization.

Apparently this policy of the Jersey Company and its subsidiaries has been successful thus far in preventing any overt expression of labor unrest and has stifled any attempt of the industrial union to organize its workers. "For some thirty years now, men and management of companies affiliated with Standard Oil Company (New Jersey) have worked together in harmony and understanding based on a philosophy of mutual respect." But industrial relations are never static; they are subject to continuous change. This fact suggests two hypothetical but logical situations that might arise under the arrangement whereby the Jersey Company and its subsidiaries bargain individually with independent associations. On the one hand, it is conceivable there could be a change in the conciliatory attitude of management toward labor if, for example, the board of directors or the stockholders, or both, should be of the opinion that wages and other concessions

34 Chase, Generation of Industrial Peace, p. 1.
granted to labor were disproportionate to capital returns. On the other hand, a steady growth in the strength of the industrial union might very well result in an intensive drive to organise the entire petroleum industry, in the same manner in which the Steel Workers Organization Committee successfully won over the independent labor organisations in the steel industry. In either instance, the ability of the independent association to survive the pressure that might be exerted from management or "outside" industrial unionism would depend, of course, upon the strength of its formal structure as an effective means of solidifying its labor organization and for obtaining adequate security for its members through collective bargaining.

Since the manner in which labor is formally organized, and the procedures which have been established for the process of collective bargaining are both essential to the organization of industrial relations, it is obvious that any basic differences in the respective constitutions of the industrial union and the independent association will have a significant effect upon the industrial relations in the company or plant where one or the other labor group is recognized as the bargaining agency for the employees, and will also be

reflected in the kind of agreement negotiated between management and labor. It is important to keep in mind the distinction between constitutions and collective agreements in any discussion of the structure and function of the labor organization. The constitution embodies the rules and regulations that provide the formal structure under which labor operates. In the case of the industrial union, it represents the collective will of the workers; in the case of the company union, the will of management. Closely resembling that of the company union is the constitution of the independent association. While the latter may represent the will of the employees of a single company, plant, or department, it nevertheless contains much of the phraseology and philosophy found expressed in the constitution of the company union. The collective agreement, on the other hand, is a contract between management and labor the terms of which have been incorporated only after negotiations.

Basic to the social structure of any labor group are the common objectives (that flow from the economic motivations) which in the first place were influential in bringing the individual members together to form the association, presumably for collective security. Not only do the stated objectives or purposes of the organization give meaning to the group relationships for each member, but, in a large measure, they frequently determine the form of the social structure
through which collective action can be directed toward the satisfying of group needs and desires. Although it is fully recognized that the purposes stated in the written constitution often may not be achieved in actual practice, and that it would be very valuable to analyze the results achieved as well as the structure and functions of the labor organization, such a detailed analysis would go considerably beyond the scope of this study. The following discussion, therefore, will be divided into two parts: first, an analysis of the constitutional provisions of the industrial union and the independent association, and secondly, an analysis of the collective agreement, particularly with respect to the sections providing for grievance procedure and arbitration.

As a consequence of the structural changes in the original employee-representation plans of the Jersey Company which were necessitated because of federal legislation and court decisions, the independent association that has evolved appears to approach the characteristics of the industrial union, especially if its external structure is observed only casually or superficially. It is only upon a more careful scrutiny, however, that these two types of labor organizations are found to be quite varied in the structure and function of their internal operations.

The basic differences between the formal organization of the union and the independent association are
revealed by the manner in which their respective objectives are stated, and by the degree to which freedom of expression is granted to individual members. The industrial Oil Workers International Union "believing it to be the natural right of those who toil, that they shall enjoy to the fullest extent the wealth created by their labor, realizing that it is impossible to obtain the full reward of labor, except by united action and through organization founded upon sound principles along economic, co-operative lines...organize into a Union for the purpose of collective bargaining and other mutual benefits (and) it shall be the object of this organization to work for the reduction of hours of daily toil, the establishment of equitable conditions, and to adjust and establish a high standard of conditions and commensurate annual wage, thereby assuring to all workers in the industry just compensation and time to share in the benefits flowing from the organization." Compared with this statement of objectives on the part of the industrial union, that of the independent association seems less vigorous and forthright: "to act as a bargaining agency between employees and the management of Standard Oil Company of New Jersey (now the Esso-Standard Oil Company), Louisiana Division, to promote cooperation between

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36 Constitution and By-laws of the Oil Workers International Union (C.I.O.), 1947-1948, as adopted by the 18th convention held at Kansas City, Missouri, August 11-16, 1947, Preamble and Article I, Sec. 3, pp. 3-4. Hereinafter referred to as the OWIU constitution.
the employees and the management; to give employees a voice in matters of mutual interest, including wages, hours of work, safety, sanitation and other working conditions; to provide an orderly and expeditious procedure for the prevention and adjustment of differences; and to accord a means through which employees may be furnished information of mutual interest by management; and to promote the principles of the association and advance its welfare; to bring into closer association the members of this organization and to negotiate and sign agreements with the management of the Standard Oil Company of New Jersey, Louisiana Division. 37

Following the statement of objectives, there are included in the constitutions of both labor organizations provisions for membership eligibility, meetings, dues, officers, and election procedures.

Membership in the industrial union and the independent association are contrasted principally by their limitations. The independent group confines its membership to the employees of a single departmental plant, 38 and it segregates the employees eligible for membership into white and colored sections "with each section electing its own officers and committees

37 IWA Constitution, Article II, Sec. 1, pp. 1-2.

and assessing their own dues." The membership of the industrial union includes all persons engaged in any branch of the petroleum industry or in "allied industries peculiar to the oil industry", and while "no person shall be refused membership because of race, creed, color or sex"...anyone "accepting membership in the Communist or Fascist organizations shall be expelled." One major consequence of having its membership limited to a single departmental plant is that the independent association has little or no contact with outside organized groups. Ignorance of the activities of similar organizations or of the prevailing conditions in other companies and plants doing essentially the same kind of work may very easily prevent the independent association from performing one of its most important functions, that of bargaining for the adoption of improved standards which may be in force elsewhere. While segregation of employees into racial groups may be influenced by the culture pattern of the region, there is none-the-less the inherent danger that in bargaining with each group separately management is in an advantageous position of being able to play one group off against the other.

39 Ibid., Article I, Sec. 1, p. 1.
40 GWIU Constitution, Article I, Sec. 1, Local Article I, Sec. 1, pp. 3,56.
Closely related to membership eligibility is the matter of financial dues and assessments. The amount of dues, the frequency of additional assessments, and whether or not an initiation fee is a requirement of membership are all rather important factors. Prospective members may be very reluctant to join, or even be dissuaded from joining a labor group if they think the financial costs are too high. On the other hand, the amount of dues may become a factor for enhancing competition between rival labor organizations. For example, assuming all other things are equal, the initiation fee ranging from $2.00 to $25.00 in the industrial union plus the monthly dues of $2.50 to $3.00 might very well be a determining factor in the preference of the worker for the independent association which has no initiation fees and whose dues "shall be no more than 50 cents per month," while "in no case shall dues and assessments amount to more than two dollars in any month." Also of significance for a functioning labor organization are the purposes for which funds are expended. In the case of the isolated independent association where the funds will be used only for their immediate group needs, there is no incentive for more than anything but a nominal charge; furthermore the members are less apt to

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41 Ibid., Article X, Secs. 3, 6, pp. 28-30.
42 IWA Constitution, Article XIV, Sec. 2, p. 15.
resent the payment of dues if the amount is small and the treasury is to be used only for their own group. It is often-times difficult for the employees to see the interrelationship between the local industrial union and its regional and national offices, and to understand the need for contributing to the support of these offices. This is especially true if the international unions are large, have a fairly large treasury, and are located some distance from the local.

Small per capita dues mean, of course, a small or limited treasury. While primarily the function of the labor organization is to obtain benefits for its group through the peaceful means of collective bargaining, the fact remains that the principal weapon of labor is the withholding of its services; namely, the strike. If financial means for supporting a strike are unavailable, the bargaining power of the labor group is seriously weakened; it can wield nothing more effective than a rather impotent "threat of strike". This is the position that obtains in the case of the independent association. Not only are its per capita dues small and its assessments limited, but it is further restricted by terms of its constitution which states that "when the membership per capita fund of ten dollars shall have been accumulated in the treasury, such dues shall be suspended, and no greater amount will be allowed to accumulate." 43 Without adequate

43 Ibid., Article XIV, Sec. 1.
funds to support a strike of any considerable proportion or duration, the independent association, in its collective bargaining on a controversial issue, generally would be forced to capitulate, to accept a compromise in favor of management, or to postpone its demands until such time as management would be willing to concede the gains won by the industrial union in other companies or plants. If the independent association should decide to strike, it would almost certainly result in failure. It has no allied group upon which it could call for assistance while management would have behind it the full resources of the giant Jersey corporation, and the loss of a strike would mean a serious decline in the prestige of the association.

In addition to its important function as a bargaining agency for collective security, an equally important function of the labor organization is to serve as a social group by means of which the members may satisfy their human need of group association, and through which they may be provided with an opportunity of self-expression. Since the activities of the labor group are normally carried on under the leadership of its officers, one measure of the effectiveness of organization as a social group is the degree to which the rank and file members have the opportunity to make known their ideas, wishes and opinions on matters concerning the welfare of the group. The value of the labor organization to its
Plate XXIV

Refinery Maintenance Workers
Esso–Standard Refinery, Baton Rouge, Louisiana

Photo by Bubley
members is considerably enhanced if the group meets regularly and if it offers the members the democratic privilege of choosing its officers and representatives in a free election by secret ballot.

Of the two types of labor organizations, the importance of the membership group coming together for a free and full discussion of its problems apparently is better realized by the industrial union. It is very specific in its insistence that a local union hold regularly scheduled meetings not less than once a month upon the penalty of forfeiture of its charter if it fails to do so.44 It likewise provides that all meetings shall be presided over by the president, that he shall call special meetings at the request of seven members, and that seven members shall constitute a quorum.45 The only provisions in the constitution of the independent association for meetings of the full membership are those providing for "an annual meeting prior to the annual election", and the special meetings called by the president of the council "when requested by the Council or on written request of not less than 100 members of the Association."46 At such meetings it is implied that no official action can be taken on behalf of the association, particularly since "no quorum

44 CWIU Constitution, Local Article I, Sec. 4, p. 57.
45 Ibid., Article II, Sec. 3, p. 58.
46 LIWA Constitution, Article XI, Sec. 1, pp. 11-12. Incidentally, one member of the association who has been a representative for five years stated there has been no general meeting of the association during the past five years.
will be necessary" and any chairman or other officers elected at Association meetings "will preside in an ex-officio capacity". 47

There are also notable differences between the industrial local union and the independent association with regard to the organization of their governing bodies, the election of their officers. The industrial local, of course, is subject to the rules and regulations of the international union to which it belongs. Officers of the international are nominated at a convention to which all locals send delegates in proportion to their active membership, 48 and each delegate is entitled to vote an equal proportion of his local membership. Nominations are reduced by secret ballot until there are only two candidates for each office. These nominations are then submitted to the individual members of all locals who vote upon their choice by secret ballot; thus every member of the union participates directly in the election of its international officers. 49 In the election of its local officers, nominations are made from the floor at a regular meeting of the membership with no limit placed upon the number


48 Each local is permitted three delegates for the first 500 members, and one delegate for each additional 500 members. OMWU Constitution, Article III, Sec. 6, p. 8.

49 Ibid., Article XV, Secs. 1, 2, pp. 48-50.
of nominations for any office. The election procedure follows that of the Australian ballot system.\(^50\) Officers of the industrial union local generally are a president, three vice-presidents, financial-corresponding secretary, treasurer, and a board of trustees usually composed of five members. Officials of the local are elected for a period of six months, except for the financial secretary and treasurer who hold their offices for a full year.\(^51\)

In the independent association there is no provision for the direct election of officers by the Association membership. Annually the membership elects representatives on the basis of one representative for every one hundred employees of a voting division, each such voting division being entitled to at least one representative. Voting divisions are set up on the basis of departments which usually follow along the lines of the various crafts such as the machinists, boilermakers, carpenters, and so forth, and according to the various departments into which the refining processes are divided: alcohol, oil movement, cracking coil, etc.\(^52\) Nominations for the office of representative are obtained in two ways: either a candidate may nominate himself by giving

\(^{50}\) Ibid., Article II, Sec. 1, p. 57.
\(^{51}\) Ibid., Article II, Sec. 2, pp. 57-58.
\(^{52}\) LIWA Constitution, Article IV, Secs. 2, 3, p. 4; and also from information obtained from Mr. L. M. McGraw, president of the independent association.
written notice to the secretary of the Council thirty days prior to the election, or the name of a candidate may be placed upon the ballot of his department if twenty-five per cent of the membership in that department so request in a signed petition. There is no Association meeting called for the purpose of obtaining nominations.\textsuperscript{53}

Ballots for the election of representatives are mailed each year to the membership with a limitation of fifteen days in which to return the ballot,\textsuperscript{54} and candidates are elected by majority vote of those casting their ballots. Representatives are elected for a period of one year; however, since representatives must be employees of the departments from which they are elected, transfer to other departments or promotion to supervisory positions automatically ends their tenure of office. Recall of a representative by his department because of unsatisfactory service is provided for in the constitution and by-laws if a petition signed by fifty-one per cent of the department membership is presented to the Council secretary.\textsuperscript{55}

At the last election of the Association held in May

\textsuperscript{53} \textit{Ibid.}, Article IV, Sec. 4, p. 5.

\textsuperscript{54} Cf. \textit{Morning Advocate}, Baton Rouge, Louisiana newspaper, May 19, 1948, p. 6A. The fifteen day limitation apparently is a Council ruling for the constitution makes no such provision.

\textsuperscript{55} \textit{IWW Constitution}, Article V, Sec. 4, p. 6.
of 1948, sixty-five representatives were elected. These representatives constitute the Council or the administrative body of the independent association which, after being elected and under the provisions of the constitution and by-laws, operates almost independently of the Association. There are no formally stated means by which the actions of the Council are subject to the approval or disapproval of the full membership of the Association; on the contrary, "the action of the Council shall be final in all matters."56

Meetings of the Council are scheduled to be held once a month, or the president may call a special meeting upon three days' notice, or upon the request of one-fourth of the Council members.57 At the first regularly scheduled meeting of the Council after its election, officers of the Council and the Association are elected from among the Council, and a member must be present in order to be nominated. Candidates for the offices of president, two vice-presidents, a secretary and a treasurer are elected by secret ballot.58

A Council member may be suspended by majority vote if he is charged by one or more other members because of "disorderly conduct, or slander against any other member, or breach of trust and confidence, or willfully giving any information of a confidential nature to others outside the

56 Ibid., Article XII, Sec. 6, p. 13.
57 Ibid., Article XII, Sec. 1, p. 12.
58 Ibid., Article VI, Sec. 1, p. 7.
Council, or inciting discontent and falsifying or undermining the Council or Association, or any other act detrimental to the welfare of the Association. This is a rather broad statement which might very easily interpret the actions of a member who was interested, for example, in affiliation with an outside union as "inciting discontent" or as an "act detrimental to the welfare of the Association". It likewise implies that the proceedings of the Council are not published or made known to the general membership of the Association, for while the terms "Council" and "Association" are used throughout the above cited article, a Council member may be charged for disclosing confidential information "to others outside the Council". With a membership of only sixty-five, it is noteworthy that the Council is restricted by the constitution and by-laws from engaging in unlimited debate on any issue before it; "Members of the Council shall speak no more than twice on any subject in debate and shall be limited to five minutes unless given special privilege which shall require a request to the chair and a majority vote of the Council."  

One of the most important functions of the formal structure erected by the constitution and by-laws of the

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59 Ibid., Article XII, Sec. 7, p. 13.
60 Ibid., Article XII, Sec. 4, p. 13.
labor organization is to provide the means whereby the stated objectives and purposes of the group can be carried out most effectively. As previously mentioned, both the industrial union and the independent association are primarily organized for the purpose of serving as the bargaining agency of labor in its negotiations with the representatives of management. By very definition negotiations between representatives of labor and management signify that the purpose of collective bargaining is to reach an agreement satisfactory to both parties. Usually such an agreement will be a written and official record concerning wages, hours, and conditions of work. It will also be in effect for a specified period of time and will provide for a procedure for handling any grievances or disputes which may arise while the agreement is in effect. Thus, formal machinery is established for the adjustment and final settlement of grievances; those disputes which may arise "out of the interpretation, application, or violation of any provisions of the agreement may be submitted to the grievance machinery."61

The modern collective agreements negotiated between the large industrial unions and big petroleum corporations often may vary in their specific provisions but basically they are very much alike. All contracts negotiated on behalf of the Oil Workers International Union, for example,

61 Marquardt, op. cit., p. 17.
must contain: recognition of the Oil Workers International Union, CIO as the exclusive bargaining agent for the unit; basic agreements as to wages and hours including provisions for paid vacations, sick leave, severance pay, premium pay for overtime and shift work, and specified paid holidays; a method for final settlement of all complaints and grievances through the medium of arbitration, such grievance machinery to provide for local settlement; conditions of work such as safety requirements and assurance for maintenance of first aid and accident equipment; and the agreement must also include provisions for determining seniority. These basic provisions are also included in the agreement between the Independent Industrial Workers' Association and the Esso-Standard Oil Company.

It would be impossible, within the scope of this discussion, to include an analysis of all the various provisions found in the several collective agreements negotiated between labor and management in the petroleum industry. A sample of agreements negotiated by the Oil Workers International Union shows they may range from nine mimeograph pages to sixty-four closely printed pages. These would be

64 Of. OMIU Agreements with Rig Building Contractors (9 mimeograph pages), Sinclair Refining Company (28 printed pages), Atlantic Refining Company (56 printed pages), Gulf Oil Company (64 printed pages).
even longer were they to include a detailed listing of occupational classifications and wage rates such as is included in the agreement of the independent association which runs to 115 printed pages, thirty-six of which are devoted to occupational wage rates. What is of prime importance here is the manner in which labor is organized in order to bargain for these various provisions, and the types of formal machinery that are set up for the handling of labor grievances.

Although every contract negotiated on behalf of the Oil Workers International Union is required to include provisions for grievance procedures and arbitration, and while the steps in the grievance procedure are essentially the same, the organization of the local union for participation in the process of settling disputes is not necessarily the same in every case. Since the basic unit of the international union is the local, much depends upon the size of the local and the organizational structure of the petroleum unit with which the agreement is negotiated.

The most important members of the grievance organization are the union stewards or committeemen. Stewards for every department are elected by local union membership and


66 Unless otherwise stated the following discussion of the Oil Workers International Union procedures is based upon an analysis of a number of its agreements, and upon information obtained from local representatives of the union and the C.I.O. in Baton Rouge, Louisiana.
serve for a period of six months. One of the more important functions of the international union is to provide the local union with material, teaching aids and a stewards' manual, and to encourage the local to give an intensive program of training in the handling of disputes and how to work cooperatively with the foremen. This training program, though less elaborate, is very similar to the training courses provided for foremen and supervisors in the larger petroleum companies.

The principal duties of the stewards are twofold: to attempt to settle individual grievances on the spot between first line management and the worker, and to be on the alert for any violations of the union agreement. The efficiency of a steward is measured by his ability to attempt to settle immediately any dispute that arises within his jurisdiction. He must also be able to evaluate the complaint on its merits and not simply to press a case because it involves one of his union members. Once a week the stewards of each plant meet informally at a "steward council" to discuss unsettled grievances as to their merits and possible solutions.

In addition to the stewards in each plant, the union generally provides for a Grievance or Workmen's Committee. The size of this committee often is determined by negotiation and included in the agreement. The reasons for this are that a very large committee might seriously hamper
production if it were necessary to call a meeting during working hours, and a committee too small might prove to be ineffective. The Workmen's Committee, elected by the membership of the plant local, may include members who are also stewards, and a usual practice is to have the secretary of the local serve on this committee. The Workmen's Committee functions whenever a dispute cannot be settled amicably below the management at the level of plant or company executive. This grievance committee is not to be confused with the Bargaining Committee which is composed of rank and file members of the local and their officers and which is responsible for negotiating the collective agreement between the union and management.

Despite many variations in specific details, the general procedure for handling labor disputes is somewhat along the following steps. In every case an attempt is made first to settle the grievance with the immediate supervisor of the aggrieved worker. Within a certain period after the occurrence of the event complained of (generally four days), the individual employee has the option of approaching the foreman directly, or if he wishes, he may be accompanied by his steward. If settlement is not obtained the case may be presented to the next higher management authority, usually the departmental foreman. Should the decision of the department head still be unsatisfactory, the case is referred
in writing to the Workmen's Committee. After a careful re-
view of the facts in the case, and if the committee feels
it has merit, the matter may then be presented to the plant
or company executive or his representative. In the event
that union and management are unable to reach a mutual agree-
ment, the case may then be referred to arbitration. While
it is the policy of the international union to encourage
the local to carry its own case through to final settlement
whenever possible, the local may call upon the international
for assistance at any time after the case in question reaches
the Workmen's Committee.

In the arbitration procedure, management and the
union each appoint a member of a three-man board of arbitra-
tion. The third member may be selected mutually by the man-
agement and union representatives, or an outside agency such
as the Federal Conciliation Service or the American Arbitra-
tion Association may be asked to appoint someone to serve
as the third member. In almost every instance, the agree-
ments provide that the decision of the arbitration board shall
be final and binding upon the parties involved.

Because of the basic differences that already have
been revealed in the formal structure of the independent as-
sociation and the industrial union, the organization of the
independent association for handling disputes differs from
that of the industrial union, although the steps in the
grievance procedure are not radically different. The constitution of the independent association, however, embodies some of the details of the grievance machinery, a practice typical of the earlier company unions. Consequently no agreement can be negotiated that violates these constitutional provisions and the organization of the independent association established for handling employee grievances is thereby affected. A major and very significant difference between the agreements negotiated by the industrial and independent labor organizations is created by these constitutional provisions of the independent association.

The agreement negotiated by the industrial union is effective for the entire plant or company unit for which the union is the recognized bargaining agency. In the case of the independent association, however, its agreement with management is merely a "general agreement". In other words, the elected representative of a department is authorized "to execute the provisions of all contracts with management" pertaining to his department, except that "in no case shall a representative sign an agreement which is in conflict with those by-laws or the general agreement between the Association and the company." Such "departmental agreements"

are generally expected to be ratified and filed with the Council which "shall endeavor to attain uniformity in these agreements."\(^6^9\) This means that the representatives of each department who are empowered to meet with management representatives "in adjustments of grievances or matters of cooperation or mutual interest" and who "shall pursue each and every just grievance to its final conclusion"\(^7^0\) are primarily concerned with disputes arising from the agreements which they have made with management for their own departments. If the departmental representatives should be unable to "settle or adjust a matter with the management to the satisfaction of all concerned, then the representative shall refer the whole matter to the Council for consideration."\(^7^1\)

The general agreement itself, negotiated between the independent association and management, also includes special provisions for various groups of employees, and several detailed appendices are attached to the agreement.\(^7^2\)

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\(^6^9\) *Ibid.*, Article XII, Sec. 5, p. 13.

\(^7^2\) Exhibit "B-1" contains provisions for hourly employees with respect to hours, occupational classifications, wage rates, overtime and shift pay, and other sections dealing with absences and lunch and rest periods (Articles I-VIII, pp. 51-65). Similar provisions are included in Exhibit "B-2" for the salaried employees (Articles I-V, pp. 66-73). Exhibit "C-1" concerns the vacation policy, rules and regulations, for wage earners and salaried wage earners (Articles I-VIII, pp. 74-81). Exhibit "C-2" contains the same information as "C-1", except that it covers only salaried employees (Articles I-VIII, pp. 82-88). Seniority rules are outlined in great detail in Exhibit "E-1" covering general rules, process operations and mechanical operations (pp.92-115).
Plate XXV

Electricians Checking Wire Insulation
Esso-Standard Refinery, Baton Rouge, Louisiana

Photo by Rosskam
As previously mentioned, the grievance procedure follows along the same lines as outlined above for the industrial union. The employee must first seek to have the matter adjusted with his department foreman, either in person or through his association representative. The next step, if the decision of the department foreman is unsatisfactory, is for a request to be made to the "employee relations division of the manufacturing department of the Louisiana division of the company by the association representative for a hearing as hereinafter set forth." The next steps, then, are always cleared through the employee relations division, and the grievance machinery becomes less effective compared with that of the industrial union. Upon the receipt of a request for a hearing "the employee relations division will designate the person who shall meet with the ... association, (and) that person shall fix the time and place, shall conduct the hearing, record the issue, and make a complete and impartial record of the facts." The decision on the case is rendered on the basis of this record by the division superintendent in which the dispute occurs. The dispute may be taken through two additional levels of management in the

73 For outline of grievance procedure, see IIAW Agreement, Article V, Secs. 1-4, pp. 8-9.
74 Ibid., Article V, Sec. 1, p. 8.
75 Ibid., Article V, Sec. 2, p. 9.
case of unsatisfactory decisions. The employee relations department may be requested to arrange for a hearing before the assistant general manager of the plant, and finally for a hearing before the general manager. "With the decision of the General Manager it shall be considered that all steps in the grievance procedure under the provisions of this contract have been taken, except...any question as to the interpretation of the terms and provisions of this contract or any question of fact arising out of an alleged violation of the terms of this contract which cannot be amicably adjusted and settled in the grievance procedure may, at the request of either party, be submitted to a Board of Arbitration." As was the case in the grievance machinery of the industrial union, a time limit is provided for settling the dispute.

The arbitration procedure is identical with that previously discussed. A three-man board is appointed, one representing each the independent association and management and a third member to be selected by the independent association and management, or, in the event they cannot agree on a third party, the American Arbitration Association will be asked to appoint the third member. The decision of the majority of the board is final.

76 Ibid., Article V, Sec. 4, and Article VI, Sec. 1, pp. 9-10.
Generally the grievance procedure applies to disputes involving an individual employee or a small group of employees. When matters of general interest to all employees of the labor organization are subject to discussion such as wages, hours or working conditions which are general in character and affect a large number of employees, such disputes may be handled by a member of the international union outside the employees of the company who is designated by the president of the Oil Workers International Union. Since the independent association has no outside affiliations upon which to call for the purpose of discussing and adjusting matters concerning wages, hours and other working conditions, and other matters of mutual interest and concern, it must bargain with the management without any outside expert advice or assistance; at least, no person other than the designated representatives of the Association and the Company (the designated representatives to be employees of the Manufacturing Department of the Standard Oil Company of New Jersey, Louisiana Division) attending such meetings shall have any right to participate in any negotiations between the Association and the Company under and pursuant to the terms and provisions of this contract.78

77 Cf. OMW Agreement with Sinclair Refining Co., Article XXIII, Sec. 9, p. 23.
78 IWAW Agreement, Article III, Sec. 1, pp. 3-4.
In summary then, labor in the petroleum industry is found to be represented by two divergent types of organizations: the industrial local with its affiliation with the Oil Workers International Union, and the independent association whose membership is confined to the eligible employees of a single company, plant, or department. Compared with the industrial union, the independent association is under much greater handicaps in its negotiations with management.

In the first place the independent association still suffers from the constitutional limitations inherent in the earlier company union or employee-representation plans from which it has evolved. Originally the company union or the employee-representation plan was conceived, developed and financed for many years by management, and the fact that many constitutional provisions of these so-called independent unions are now found in the constitution and by-laws of the present day Independent Industrial Workers' Association implies that it is not yet entirely free from at least indirect management control. It is also significant that the development of the independent association was not the result of spontaneous employee action or initiative, but rather it was created as a direct consequence of legislation and judicial decisions compelling the company to abandon its former worker organizations.

Limited to a single company, plant or department, and
having no contact with other labor organizations, the independent association is unable to acquire adequate knowledge of existing conditions or comparative wage scales. In its negotiations with management concerning a general wage increase, for example, the independent association may not bring into the meetings any outside expert assistance; it must rely solely upon its own elected representatives. This fact and the limitations which are placed upon its treasury tend to make the independent association rather impotent in any negotiations over a crucial issue, and often it is compelled by the circumstances to accept compromises favorable to management. For instance when a recent "cost of living bonus" was granted in the early part of 1948, the Independent Industrial Workers' Association had to be content to accept an increase based upon "the National Consumer Price Index of the Bureau of Labor Statistics of the United States Department of Labor." Since this index uses only one city in Louisiana, New Orleans, the independent association accepted a cost of living bonus based upon figures for that city although similar data were compiled and published which revealed a much higher percentage increase in the cost of living had occurred in Baton Rouge, Louisiana, where the refinery is located.

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79 Ibid., Article IV, Sec. 1(b), p. 4.
Another serious weakness of the independent association is the fact that it is prevented by its constitution from building up any large treasury. Thus, without funds and without outside assistance, the association is deprived of its chief weapon, the strike.

Further handicaps to the association are the practices of having each department execute its own agreement with management, and of dividing the association into separate white and colored sections. These practices tend to create a situation in which it would be very difficult to obtain one hundred per cent cooperation of the association on controversial issues unless all or the majority of these several subdivisions were directly involved.

Finally, should a grievance arise that is not subject to collective bargaining such as rates of pay, wages, hours of work or other conditions of employment, it is denied the use of arbitration. In other words, unless there is a question "as to the interpretation of the terms and provisions of this contract (the general agreement) or any question of fact arising out of an alleged violation of the terms of this contract....", it cannot be submitted to arbitration. 81

In view of these weaknesses inherent in the structure of the independent association, it might well be asked why

81 ITWA Agreement, Article V, Sec. 2, Article VI, Sec. 1, pp. 9-10.
the employees continue to be so strongly in favor of such a labor organization. One possible explanation is that the present independent associations have been free from management control and domination, at least legally, only in the last few years. The long years during which the employees' organization was company-controlled undoubtedly has contributed to the development of the idea among workers "that men and management would get along almost as smoothly as if there were no collective bargaining machinery." But perhaps equally as important in developing strong feelings of loyalty to the company have been the various welfare and benefit plans which the Jersey Company initiated at the same time, or shortly after, the establishment of the employee-representation plans. The company has pursued a policy of identifying these plans -- benefits and employee-representation -- as part of a single employee relations program, and both are handled through the employee relations department. In speaking of its employee relations program which was inaugurated in 1918, the Jersey Company states: "Collective bargaining on a cooperative and friendly basis has been a fundamental principle of the Company's worker-manager relations for over 30 years. A plan for annuities and benefits was established in 1918, expanding pensions and

82 Chase, A Generation of Industrial Peace, p. 50.
providing benefits for sickness, disability, and accidents. Death benefits under group contracts were added in the same year. Paid vacations for all workers were introduced in 1923 -- a revolutionary innovation for those days. The Employees' Thrift Plan, a combined annuity and savings program to which both employees and the Company contribute, was established in 1936.\textsuperscript{83}

This statement clearly indicates that management, in 1948, still makes no distinction in their employee relations program between paid vacations, for example, which is subject to collective bargaining and the annuity and benefit plans in which the independent association has no voice as to the provisions and administration of such plans. The so-called Employees Thrift Plan defines as an employee, "a person who is regularly performing the duties of an established full-time job, position or office whether or not the person is a director."\textsuperscript{84} The plan is administered by "an administrative committee of three to be appointed by the board of directors" (of the Jersey Company) ... and "the board of directors may at any time remove any and all of the administrative committee."\textsuperscript{85} The Jersey Company "may, in its discretion and without notice to members, modify or terminate

\textsuperscript{83} Introduction to Standard Oil Company (M.J.), p. 21.  
\textsuperscript{84} Employees Thrift Plan (Edition of July 1, 1945), Standard Oil Company (M.J.), Part II(g), p. 5.  
\textsuperscript{85} Ibid., Part IV, pp. 7-8.
any annuity contract..."86 and "there is reserved to the board of directors the right to amend, modify, alter, suspend or terminate this plan in whole or in part ... Notice of such change will be given in writing to all members and employers participating in the plan."87

That the employee contributions to the plan are supplemented by the company88 in no small measure accounts for the fact that "although participation is entirely voluntary, 97 per cent of the domestic employees are enrolled in the plan."89 Since benefits accrue under these plans with longevity of service and are terminated when a member ceases to be an employee,90 it is very possible that the prospect of these accumulative savings is a factor largely responsible for twenty-two per cent of the domestic workers in the Jersey Company having twenty years or longer service.91 Furthermore, the absolute control of the plan by the board of directors may very possibly deter the workers from abandoning an independent labor organization if they believed such action might jeopardize their benefit plan.

86 Ibid., Part VI, Sec. 1, p. 9.
87 Ibid., Part IX, p. 21.
88 Ibid., Part VII, Sec. 3 (d), Part VI, Sec. 3(c), pp. 16, 11.
90 Employees Thrift Plan, Article VI, Sec. 4, p. 10.
PART VI

CONCLUSION
CHAPTER X

CONCLUSION: SOCIOLOGICAL IMPLICATIONS

A study of this kind which relies on the method of descriptive analysis does not lend itself very readily to drawing specific conclusions. The main merit of this study lies in bringing together hitherto unintegrated information concerning one of the sociologically most interesting industries, the point of reference being the social organization or the institutionalized forms of human relations within the industrial enterprises. Although the study encompasses the entire petroleum industry from the oil field to the filling station, the emphasis is in most instances on crude oil production and refineries. While drawing heavily upon existing literature, the study also utilizes hitherto unexplored material from Congressional hearings. Entirely new is the analysis of the labor force and most of the discussion of occupations. The comparison between the two types of workers' organizations should be timely in view of recent developments, and valuable from a broader and more theoretical point of view.

Although narrowed down to a single industry, the integrated picture of the petroleum industry presented in this monograph was subject to definite limitations. While it is very unlikely that any important social aspect of the industry has been overlooked, the study does not claim to be complete.
It was often necessary to confine the study to certain segments or activities of the petroleum industry because of the vast, complex structure of the industry, and furthermore, it was possible to deal only with the structural elements of the industrial social organization. The reader undoubtedly was aware throughout the study that a number of interesting sociological problems were not fully developed and analysed, and of others which apparently were not fully exploited or touched upon at all. Unfortunately this is almost always the case in studies of this kind where limitations are imposed by the very nature of its comprehensiveness.

However, the study has attempted to provide a sound sociological basis for additional social studies that might treat more in detail some of the social aspects presented here, especially from the point of view of the industry as a functioning social organization which has been done only in a limited manner in this monographic study.

In its organization and method, the study also has suggested a possible approach that might prove useful for sociological research and analysis in the field of industrial studies of contemporary American society.

One of the more significant aspects of the industrial social organization that has been emphasized in the study is the importance of understanding the influence of culture and social conditions upon the formation and development of the large-scale industrial enterprise. As a social and cultural
product, the transformation of the modern petroleum industry concern -- from economic individualism and private enterprise under laissez-faire to the giant vertically-integrated mass production corporation under absentee ownership and control -- has not been an inevitable result of evolutionary growth; it has been constantly restricted, modified and altered by cultural changes.

Problems of contemporary industrial society are not necessarily "industrial"; they are the accumulative culture product of changes both within and without the industrial plant or concern. They are more than merely problems of supply and demand, price structure, business cycles, or of labor unrest. The modern industrial concern of the petroleum industry has developed into a very complex social organization characterized by mass production technology, a very intricate form of corporate structure, a high degree of specialized functions and division of labor, the development of a professional management, and by the growth of labor organizations whose structures closely parallel those of the large industrial enterprises themselves.

The tremendous size and complexity of the large petroleum corporation necessarily results in an organization of management and workers for the primary objective of efficient and economical operations in order to insure a profit return to the stockholders. It is this highly efficient organization of the human factor that has become of increasing
sociological importance, particularly in the area of industrial relations. Industrial relations, the social interaction between management and labor, constitute a dynamic social system of human relationships.

The highly differentiated modern industrial social organization is composed of a number of closely interrelated individuals and groups. For its successful functioning, the large petroleum concern requires a considerable amount of occupational specialization and of cooperation among all members. The complexity of the "blue print" organization and the vastness of its operations are so involved that control of the large-scale petroleum corporation has become very remote and impersonal, and the individual worker often is without adequate knowledge and information to understand his part in the intricate process of modern manufacturing methods. The composition and arrangement of the labor force which brings to the fore differences in human abilities affects the roles and status of the workers in the formal organization of the industry, as well as their informal relationships with each other.

As the workers become more aware of their reduced security because of the manner in which their occupations have been standardized into routine tasks, they develop a need and desire for labor organization in order to bargain for additional economic and social benefits, and to regain, under new institutional arrangements, a measure of job-security. With the development of industrial relations into an alignment between
big business and big labor organizations, the sociologist will find a fertile field for additional and much needed research and investigation.

Another problem closely associated with the social organization of the petroleum industry and one which has been alluded to only in a general way, is the interrelatedness of the large-scale industrial enterprise and the community. The influence of technological and scientific developments upon industry structure and organization, or the effect upon the system of industrial relations due to a change in the attitude or ideology of management toward labor are felt at once throughout the social, economic and political life of the community. Consequent problems of technological unemployment, a change in industry location, shut-downs, or labor strikes make clear the social nature of such problems and the interdependence of large-scale enterprise and the community.

This relationship between industry and the community suggests several areas of possible study in connection with the petroleum industry. The relationship is very clear where the community is entirely dependent upon the industry; for example, in the case of "boom towns" that have almost inevitably accompanied the discovery of an oil field in an isolated or rural area. Some of these have flourished for the moment and then disappeared as quickly as they appeared; others have grown into large communities because of the
continued influence of operations in or around the original oil-field site.

Other types of communities dependent upon the petroleum industry are the "company town," and the "refinery town" built as a consequence of war-time expansion. The former is usually a small pipe-line pumping-station community which is owned and maintained by an oil company exclusively for petroleum industry workers. The latter type of community has been built by a private housing corporation and, in renting the dwelling units, preference generally has been given to employees of the local refinery. Also in this connection, although they do not have the formal characteristics of a community in the political sense of the word, should be mentioned the oil-field camps in the marshes of Louisiana, or those out on the stable platforms and "floating barges" in the Gulf of Mexico. Individual or comparative studies of these various types of "communities" would provide an interesting field for sociological research.

A third type of community in which the petroleum industry plays an important role is the town or city in which the industry, while not the only industrial organization in the area, is the largest or most important source of employment and income for the population of the community.

Although there are perhaps a number of other problems suggested by this study of the petroleum industry social organization, these two aspects -- the organization of
industrial relations, and the interdependence of large-scale industrial enterprise and the community -- suggest important areas for sociological inquiry into the social characteristics of modern industry. The former represents the dynamic functioning of the large industry as a complex social organization, while the latter type of investigation would deal with the relationship of the industry to society.
STATISTICAL APPENDIX
Table 1.

Total Assets, Date and State of Incorporation
of the Major Oil Companies¹
(December 31, 1939)

<table>
<thead>
<tr>
<th>Company</th>
<th>Total Assets (thousands)</th>
<th>State Incorporated</th>
<th>Date Incorporated³</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Standard Oil Co.¹</td>
<td>$2,031,939</td>
<td>New Jersey</td>
<td>Aug. 5, 1882</td>
</tr>
<tr>
<td>* Cities Service Co.</td>
<td>1,068,578</td>
<td>Delaware</td>
<td>Sep. 2, 1910</td>
</tr>
<tr>
<td>** Socony-Vacuum Oil Co., Inc.¹</td>
<td>929,066</td>
<td>New York</td>
<td>Aug. 10, 1882</td>
</tr>
<tr>
<td>** Standard Oil Co.¹</td>
<td>723,079</td>
<td>Indiana</td>
<td>Jun. 18, 1889</td>
</tr>
<tr>
<td>* The Texas Corporation</td>
<td>661,067</td>
<td>Delaware</td>
<td>Aug. 26, 1926</td>
</tr>
<tr>
<td>** Standard Oil Co. of California¹</td>
<td>628,618</td>
<td>Delaware</td>
<td>Jan. 27, 1926</td>
</tr>
<tr>
<td>*** Gulf Oil Corporation</td>
<td>523,292</td>
<td>Pennsylvania</td>
<td>Aug. 9, 1922</td>
</tr>
<tr>
<td>** Shell Union Oil Corporation</td>
<td>401,048</td>
<td>Delaware</td>
<td>Feb. 8, 1922</td>
</tr>
<tr>
<td>* Consolidated Oil Corporation</td>
<td>357,848</td>
<td>New York</td>
<td>Sep. 23, 1919</td>
</tr>
<tr>
<td>*** Phillips Petroleum Co.</td>
<td>223,280</td>
<td>Delaware</td>
<td>Jun. 13, 1917</td>
</tr>
<tr>
<td>*** Tide Water Associated Oil Co.¹</td>
<td>204,087</td>
<td>Delaware</td>
<td>Mar. 5, 1926</td>
</tr>
<tr>
<td>** The Atlantic Refining Co.¹</td>
<td>203,400</td>
<td>Pennsylvania</td>
<td>Apr. 9, 1914</td>
</tr>
<tr>
<td>*** Union Oil Co. of California¹</td>
<td>187,066</td>
<td>California</td>
<td>Oct. 17, 1890</td>
</tr>
<tr>
<td>** The Pure Oil Co.¹</td>
<td>178,567</td>
<td>Ohio</td>
<td>Apr. 9, 1914</td>
</tr>
<tr>
<td>** Sun Oil Co.¹</td>
<td>146,431</td>
<td>New Jersey</td>
<td>May 2, 1901</td>
</tr>
<tr>
<td>*** The Ohio Oil Co.¹</td>
<td>133,748</td>
<td>Ohio</td>
<td>Jul. 30, 1887</td>
</tr>
<tr>
<td>** Continental Oil Co.¹</td>
<td>127,661</td>
<td>Delaware</td>
<td>Oct. 8, 1920</td>
</tr>
<tr>
<td>** The Standard Oil Co.¹</td>
<td>76,072</td>
<td>Ohio</td>
<td>Jan. 10, 1870</td>
</tr>
<tr>
<td>*** Mid-Continent Petroleum Corp.</td>
<td>65,103</td>
<td>Delaware</td>
<td>Jul. 9, 1917</td>
</tr>
<tr>
<td>*** Skelly Oil Co.¹</td>
<td>62,048</td>
<td>Delaware</td>
<td>Aug. 20, 1912</td>
</tr>
</tbody>
</table>

Total $8,935,128

¹ Total assets are taken from the annual reports to stockholders for the year ended, Dec. 31, 1939; the name of the company, state, and date of incorporation are as reported to the Temporary National Economic Committee in response to Question 1 of questionnaire for oil companies.

² Frequently the State of Incorporation is added to the name of some companies to readily differentiate them.

³ The date of incorporation is the latest one and does not necessarily indicate the origin of the company, since some companies have reorganized.

¹ Companies which were part of the Standard Oil Trust. Some companies were reorganized and re-incorporated after the 1911 dissolution.

* Primarily holding companies; ** both holding and operating companies; *** considered primarily operating, although both holding and operating companies.

Source: Roy C. Cook, Control of the Petroleum Industry by Major Oil Companies (Monograph No. 39), Table 2, p. 3; and TNEC (Part II-A), p. 778.
Table 1(a)

Original Companies of the Standard Oil Trust

<table>
<thead>
<tr>
<th>Company</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglo-American Ltd.</td>
<td>Solar Refining</td>
</tr>
<tr>
<td>Atlantic Refining</td>
<td>South Penn Oil</td>
</tr>
<tr>
<td>Borne-Scrymser Co.</td>
<td>Southern Pipe Line</td>
</tr>
<tr>
<td>Buckeye Pipe Line</td>
<td>Southwest Pennsylvania Pipe Lines</td>
</tr>
<tr>
<td>Cheesebrough Manufacturing</td>
<td>Standard Oil of California</td>
</tr>
<tr>
<td>Colonial Oil</td>
<td>Standard Oil of Indiana</td>
</tr>
<tr>
<td>Continental Oil</td>
<td>Standard Oil of Kansas</td>
</tr>
<tr>
<td>Continental Pipe Line</td>
<td>Standard Oil of Kentucky</td>
</tr>
<tr>
<td>Cumberland Pipe Line</td>
<td>Standard Oil of Nebraska</td>
</tr>
<tr>
<td>Eureka Pipe Line</td>
<td>Standard Oil of New York</td>
</tr>
<tr>
<td>Galena Signal Oil</td>
<td>Standard Oil of Ohio</td>
</tr>
<tr>
<td>Indiana Pipe Line</td>
<td>Swan and Finch</td>
</tr>
<tr>
<td>National Transit</td>
<td>Union Tank Line</td>
</tr>
<tr>
<td>New York Transit</td>
<td>Vacuum Oil</td>
</tr>
<tr>
<td>Ohio Oil</td>
<td>Washington Oil</td>
</tr>
<tr>
<td>Prairie Oil and Gas</td>
<td>Waters-Pierce Oil</td>
</tr>
</tbody>
</table>
Table 2.

United States 19th Century Crude Petroleum Production and Reserves by State Rank, with Year of First Discovery
(Quantities in thousand barrels of \( \frac{1}{2} \) gallon)

<table>
<thead>
<tr>
<th>State</th>
<th>Rank</th>
<th>First Year</th>
<th>Crude Oil Production</th>
<th>% of Acc.</th>
<th>Reserves</th>
<th>% of U.S.</th>
<th>Year of First Discovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>-</td>
<td>1859</td>
<td>1,677,753</td>
<td>100.0</td>
<td>-</td>
<td>20,453,231</td>
<td>100.0</td>
</tr>
<tr>
<td>Texas</td>
<td>1</td>
<td>1889</td>
<td>748,122</td>
<td>44.6</td>
<td>11,375</td>
<td>55.6</td>
<td>1859</td>
</tr>
<tr>
<td>California</td>
<td>2</td>
<td>1876</td>
<td>311,793</td>
<td>18.6</td>
<td>3,374</td>
<td>16.4</td>
<td>1876</td>
</tr>
<tr>
<td>Louisiana</td>
<td>3</td>
<td>1891</td>
<td>129,207</td>
<td>7.7</td>
<td>1,573</td>
<td>7.7</td>
<td>1891</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>4</td>
<td>1902</td>
<td>121,616</td>
<td>7.4</td>
<td>970,262</td>
<td>4.7</td>
<td>1902</td>
</tr>
<tr>
<td>Kansas</td>
<td>5</td>
<td>1891</td>
<td>98,762</td>
<td>5.9</td>
<td>601,751</td>
<td>3.0</td>
<td>1891</td>
</tr>
<tr>
<td>Illinois</td>
<td>6</td>
<td>1889</td>
<td>77,113</td>
<td>4.6</td>
<td>320,711</td>
<td>1.6</td>
<td>1889</td>
</tr>
<tr>
<td>New Mexico</td>
<td>7</td>
<td>1919</td>
<td>39,555</td>
<td>2.3</td>
<td>562,564</td>
<td>2.8</td>
<td>1919</td>
</tr>
<tr>
<td>Wyoming</td>
<td>8</td>
<td>1891</td>
<td>32,348</td>
<td>1.9</td>
<td>581,730</td>
<td>2.8</td>
<td>1891</td>
</tr>
<tr>
<td>Arkansas</td>
<td>9</td>
<td>1920</td>
<td>29,119</td>
<td>1.8</td>
<td>293,059</td>
<td>1.4</td>
<td>1920</td>
</tr>
<tr>
<td>Michigan</td>
<td>10</td>
<td>1900</td>
<td>18,430</td>
<td>1.1</td>
<td>65,134</td>
<td>0.3</td>
<td>1900</td>
</tr>
<tr>
<td>Mississippi</td>
<td>11</td>
<td>1939</td>
<td>16,337</td>
<td>1.0</td>
<td>209,011</td>
<td>1.0</td>
<td>1939</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>12</td>
<td>1859</td>
<td>11,118</td>
<td>0.8</td>
<td>123,138</td>
<td>0.6</td>
<td>1859</td>
</tr>
<tr>
<td>Kentucky</td>
<td>13</td>
<td>1883</td>
<td>9,621</td>
<td>0.6</td>
<td>41,080</td>
<td>0.2</td>
<td>1883</td>
</tr>
<tr>
<td>Montana</td>
<td>14</td>
<td>1916</td>
<td>8,627</td>
<td>0.5</td>
<td>111,650</td>
<td>0.5</td>
<td>1916</td>
</tr>
<tr>
<td>Indiana</td>
<td>15</td>
<td>1889</td>
<td>5,118</td>
<td>0.3</td>
<td>31,493</td>
<td>0.2</td>
<td>1889</td>
</tr>
<tr>
<td>New York</td>
<td>16</td>
<td>1860</td>
<td>4,697</td>
<td>0.3</td>
<td>85,831</td>
<td>0.4</td>
<td>1860</td>
</tr>
<tr>
<td>West Virginia</td>
<td>17</td>
<td>1876</td>
<td>3,070</td>
<td>0.2</td>
<td>40,755</td>
<td>0.2</td>
<td>1876</td>
</tr>
<tr>
<td>Colorado</td>
<td>18</td>
<td>1887</td>
<td>2,344</td>
<td>0.2</td>
<td>88,823</td>
<td>0.4</td>
<td>1887</td>
</tr>
<tr>
<td>Ohio</td>
<td>19</td>
<td>1876</td>
<td>2,937</td>
<td>0.2</td>
<td>31,621</td>
<td>0.2</td>
<td>1876</td>
</tr>
<tr>
<td>Nebraska</td>
<td>20</td>
<td>1923</td>
<td>1,417</td>
<td>-</td>
<td>581</td>
<td>-</td>
<td>1923</td>
</tr>
<tr>
<td>Alabama</td>
<td>21</td>
<td>1941</td>
<td>143</td>
<td>-</td>
<td>317</td>
<td>-</td>
<td>1941</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>-</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>295</td>
<td>-</td>
</tr>
</tbody>
</table>

1Florida (1943), Missouri (1934), Tennessee (1934), Utah (1932), Virginia (1944).

<table>
<thead>
<tr>
<th>State</th>
<th>Refineries</th>
<th>Daily Refinery Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Independent</td>
</tr>
<tr>
<td>United States</td>
<td>398</td>
<td>266</td>
</tr>
<tr>
<td>Texas</td>
<td>88</td>
<td>58</td>
</tr>
<tr>
<td>California</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>Indiana</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Illinois</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Louisiana</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>New Jersey</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Ohio</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Kansas</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>Kansas</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Michigan</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Wyoming</td>
<td>29</td>
<td>19</td>
</tr>
<tr>
<td>New York</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Maryland</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Kentucky</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Arkansas</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Montana</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Missouri</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>New Mexico</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Utah</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Colorado</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>West Virginia</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Nebraska</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tennessee</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>South Carolina</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Washington</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Minnesota</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Georgia</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mississippi</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Idaho</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>South Dakota</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Sources: 1. Oil and Gas Journal, XLVII (March 31, 1945), 296-298. 2. Independent Petroleum Company, p. 208. These refineries are owned and operated by 234 Independent Refiners.
### Table 4.

Frequency Distribution by Size of the Total and Independent Refineries in U. S., 1945

(Capacity in Barrels of Crude Oil)

<table>
<thead>
<tr>
<th>Daily Capacity</th>
<th>Total Refineries</th>
<th>Independent Refineries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per cent</td>
</tr>
<tr>
<td>Total</td>
<td>398</td>
<td>100.0</td>
</tr>
<tr>
<td>Under 5,000</td>
<td>202</td>
<td>48.2</td>
</tr>
<tr>
<td>5,000 - 9,999</td>
<td>80</td>
<td>22.6</td>
</tr>
<tr>
<td>10,000 - 19,999</td>
<td>45</td>
<td>11.3</td>
</tr>
<tr>
<td>20,000 - 29,999</td>
<td>29</td>
<td>7.3</td>
</tr>
<tr>
<td>30,000 - 39,999</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>40,000 - 49,999</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>50,000 - 99,999</td>
<td>16</td>
<td>4.1</td>
</tr>
<tr>
<td>Over 100,000</td>
<td>10</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Source: Oil and Gas Journal, XLIII (March 31, 1945), 296-298.
Table 5.

List of Independent Oil Company Trade Associations

Consumers Cooperative Association of Kansas
Cooperative League, USA
Gulf Coast Refiners Association
Independent Petroleum Association of America
Independent Petroleum Association of Texas
Independent Petroleum Marketers Association of Minnesota
Independent Refiners Association of California
Indiana Farm Bureau Cooperative Association, Inc.
National Cooperatives, Inc.
National Council of Independent Associations
National Petroleum Association
National Stripper-Fields Association
Ohio Petroleum Marketers Association
Pennsylvania Grade Crude Oil Association
Retail Gasoline Dealers Association of Milwaukee
Western Petroleum Refiners Association

Source: Independent Petroleum Company, passim.
**Table 6.**

Distribution of Invested Capital by Divisions of the Industry

<table>
<thead>
<tr>
<th>Division</th>
<th>Per cent</th>
<th>Division</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil Production</td>
<td>42.7</td>
<td>Trucks and Automobiles</td>
<td>4.0</td>
</tr>
<tr>
<td>Crude Oil Pipe-lines</td>
<td>7.1</td>
<td>Refining</td>
<td>25.6</td>
</tr>
<tr>
<td>Gasoline Pipe-lines</td>
<td>0.5</td>
<td>Wholesale Stations</td>
<td>3.3</td>
</tr>
<tr>
<td>Tankers</td>
<td>4.0</td>
<td>Retail Service Stations</td>
<td>9.2</td>
</tr>
<tr>
<td>Tank cars</td>
<td>1.6</td>
<td>Natural Gasoline Plants</td>
<td>2.0</td>
</tr>
</tbody>
</table>

**Source:** TNEC (Part 14-A), Table D, p. 7701.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Unit</th>
<th>Amount</th>
<th>Major Companies</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Net Investment</td>
<td>Dollars (000)</td>
<td>12,162,000</td>
<td>20 8,108,000</td>
<td>1938</td>
</tr>
<tr>
<td>Producing Oil Wells</td>
<td>Number</td>
<td>408,629</td>
<td>20 120,156</td>
<td>1944</td>
</tr>
<tr>
<td>Crude Oil Production</td>
<td>Barrels (000)</td>
<td>1,677,709</td>
<td>20 1,029,291</td>
<td>1944</td>
</tr>
<tr>
<td>Crude Oil Trunk Pipe-lines</td>
<td>Mileage</td>
<td>51,569</td>
<td>15 45,915</td>
<td>1938</td>
</tr>
<tr>
<td>Crude Oil Total Pipe-lines</td>
<td>Mileage</td>
<td>115,000</td>
<td>20 82,526</td>
<td>1938</td>
</tr>
<tr>
<td>Gasoline Pipe-lines</td>
<td>Mileage</td>
<td>6,510</td>
<td>17 6,253</td>
<td>1938</td>
</tr>
<tr>
<td>Total Pipe-line Investment</td>
<td>Dollars (000)</td>
<td>374,378</td>
<td>15 289,652</td>
<td>1938</td>
</tr>
<tr>
<td>Tankers</td>
<td>Number</td>
<td>396</td>
<td>15 333</td>
<td>1938</td>
</tr>
<tr>
<td>Crude Oil Stocks</td>
<td>Barrels (000)</td>
<td>226,969</td>
<td>20 179,266</td>
<td>1944</td>
</tr>
<tr>
<td>Refineries (operating)</td>
<td>Number</td>
<td>398</td>
<td>20 132</td>
<td>1945</td>
</tr>
<tr>
<td>Crude Oil Capacity</td>
<td>Barrels (000)</td>
<td>5,200</td>
<td>20 4,273</td>
<td>1944</td>
</tr>
<tr>
<td>Cracking Capacity</td>
<td>Barrels (000)</td>
<td>1,537</td>
<td>20 1,320</td>
<td>1944</td>
</tr>
<tr>
<td>Crude Runs to Stills</td>
<td>Barrels (000)</td>
<td>1,665,684</td>
<td>15 1,384,021</td>
<td>1944</td>
</tr>
<tr>
<td>Gasoline Production</td>
<td>Barrels (000)</td>
<td>743,484</td>
<td>19 470,276</td>
<td>1944</td>
</tr>
<tr>
<td>Gasoline Stocks</td>
<td>Barrels (000)</td>
<td>86,830</td>
<td>19 49,319</td>
<td>1944</td>
</tr>
<tr>
<td>Domestic Sales</td>
<td>Barrels (000)</td>
<td>509,665</td>
<td>20 407,689</td>
<td>1938</td>
</tr>
<tr>
<td>Bulk Stations</td>
<td>Number</td>
<td>30,825</td>
<td>18 21,237</td>
<td>1939</td>
</tr>
<tr>
<td>Filling Stations</td>
<td>Number</td>
<td>241,800</td>
<td>18 69,666</td>
<td>1938</td>
</tr>
</tbody>
</table>

1 No attempt has been made to bring all these data up-to-date, since the Hearings on the Independent Petroleum Company indicate that any changes since 1938 did not affect materially the relative position of the majors; in fact, considerable testimony was presented to indicate, if anything, that the majors were becoming stronger. Cf. Independent Petroleum Company, pp. 33, 51-64, 522, 553.

2 TNEC: Temporary National Economic Committee Hearings; I. P.; Independent Petroleum Company; O & G; Oil and Gas Journal, (March 31, 1945).

3 Table Number.

4 Page Number.
Table 8

Selected List of Petroleum Industry Investigations

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1911</td>
<td><em>Standard Oil Company of New Jersey et al v. United States</em>, 221 U.S. 1, 55 L. Ed. 619, May 15, 1911. To review a decree dissolving a holding company as existing in violation of anti-trust act.</td>
</tr>
<tr>
<td>1923</td>
<td><em>High Cost of Gasoline and Other Petroleum Products</em>, Hearings before a Subcommittee on Manufactures, U. S. Senate, 67th Congress.</td>
</tr>
<tr>
<td>1946</td>
<td><em>Petroleum Resources and The Independent Petroleum Company</em>, Hearings before Special Senate Committee Investigating Petroleum Resources, 78th Congress.</td>
</tr>
</tbody>
</table>

Source: *Independent Petroleum Company*. 
Table 9
List of Major Companies
and the Number of their Subsidiaries and Affiliates\(^1\)
(December 31, 1938)

<table>
<thead>
<tr>
<th>Company</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cities Service Co.</td>
<td>122</td>
</tr>
<tr>
<td>The Texas Corporation</td>
<td>92</td>
</tr>
<tr>
<td>Standard Oil (New Jersey)</td>
<td>74</td>
</tr>
<tr>
<td>Pure Oil Co.</td>
<td>60</td>
</tr>
<tr>
<td>Consolidated Oil Corporation</td>
<td>52</td>
</tr>
<tr>
<td>Standard of Indiana</td>
<td>51</td>
</tr>
<tr>
<td>Continental Oil Co.</td>
<td>47</td>
</tr>
<tr>
<td>Socony-Vacuum Co.</td>
<td>32</td>
</tr>
<tr>
<td>Tide Water Associated Oil Co.</td>
<td>32</td>
</tr>
<tr>
<td>Phillips Petroleum Co.</td>
<td>32</td>
</tr>
<tr>
<td>Atlantic Refining Co.</td>
<td>27</td>
</tr>
<tr>
<td>Gulf Oil Co.</td>
<td>24</td>
</tr>
<tr>
<td>Sun Oil Co.</td>
<td>17</td>
</tr>
<tr>
<td>Union Oil of California</td>
<td>13</td>
</tr>
<tr>
<td>Ohio Oil Co.</td>
<td>12</td>
</tr>
<tr>
<td>Shell Union Oil Corporation</td>
<td>12</td>
</tr>
<tr>
<td>Skelly Oil Co.</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>711</strong></td>
</tr>
</tbody>
</table>

\(^1\) Includes all companies, domestic and foreign, in which major companies or their subsidiaries and affiliates held any stock, (capital, preferred) or bonded indebtedness as of December 31, 1938.

Source: TREC (Part 14-a), Appendix II, pp. 7885-8001.
Table 10
Number of Stockholders, Common Shares Outstanding of Major Oil Companies and Number and Per cent of Common Shares Held by 100 Largest Stockholders (December 31, 1938)

<table>
<thead>
<tr>
<th>Major Oil Company</th>
<th>Number of Stockholders</th>
<th>Common Shares Outstanding</th>
<th>100 Largest Stockholders Shares Held</th>
<th>% of Total Stockholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell Union</td>
<td>17,393</td>
<td>13,070,625</td>
<td>11,600,161</td>
<td>80.9</td>
</tr>
<tr>
<td>Sun Oil</td>
<td>5,226</td>
<td>2,316,484</td>
<td>1,966,008</td>
<td>84.9</td>
</tr>
<tr>
<td>Shelly Oil</td>
<td>3,522</td>
<td>995,349</td>
<td>817,245</td>
<td>82.1</td>
</tr>
<tr>
<td>Standard Oil of Ohio</td>
<td>3,532</td>
<td>752,740</td>
<td>521,166</td>
<td>69.1</td>
</tr>
<tr>
<td>Tide Water Associated</td>
<td>24,116</td>
<td>6,375,253</td>
<td>4,066,873</td>
<td>63.7</td>
</tr>
<tr>
<td>Gulf Oil</td>
<td>15,135</td>
<td>13,751,918</td>
<td>7,329,834</td>
<td>54.0</td>
</tr>
<tr>
<td>Standard Oil (W. J.)</td>
<td>126,393</td>
<td>26,023,193</td>
<td>12,562,463</td>
<td>47.3</td>
</tr>
<tr>
<td>Ohio Oil</td>
<td>31,257</td>
<td>6,363,377</td>
<td>2,955,244</td>
<td>45.0</td>
</tr>
<tr>
<td>Socony-Vacuum Oil</td>
<td>113,260</td>
<td>31,206,971</td>
<td>12,803,585</td>
<td>41.0</td>
</tr>
<tr>
<td>Continental Oil</td>
<td>29,969</td>
<td>4,738,593</td>
<td>1,688,830</td>
<td>35.6</td>
</tr>
<tr>
<td>Consolidated Oil</td>
<td>89,068</td>
<td>13,751,846</td>
<td>4,801,289</td>
<td>34.9</td>
</tr>
<tr>
<td>Standard Oil of Indiana</td>
<td>99,665</td>
<td>1,272,020</td>
<td>9,267,862</td>
<td>34.5</td>
</tr>
<tr>
<td>Pure Oil</td>
<td>29,033</td>
<td>3,963,011</td>
<td>1,999,356</td>
<td>34.1</td>
</tr>
<tr>
<td>Phillips Petroleum Co.</td>
<td>40,105</td>
<td>4,679,052</td>
<td>1,995,054</td>
<td>30.4</td>
</tr>
<tr>
<td>Union Oil of California</td>
<td>28,254</td>
<td>4,666,270</td>
<td>(2)</td>
<td>29.1</td>
</tr>
<tr>
<td>Texas Corporation</td>
<td>86,380</td>
<td>10,876,882</td>
<td>2,605,090</td>
<td>24.0</td>
</tr>
<tr>
<td>Atlantic Refining</td>
<td>29,313</td>
<td>2,663,999</td>
<td>633,271</td>
<td>23.8</td>
</tr>
<tr>
<td>Cities Service</td>
<td>466,658</td>
<td>3,704,067</td>
<td>766,999</td>
<td>21.0</td>
</tr>
</tbody>
</table>

1 Standard Oil of California and Mid-Continent Oil did not reply.

2 Company reported percentage only.

Source: TEC, (Part 14-a), Table F, p. 7713.
Table 11
Membership of American Petroleum Institute Executive Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Company Represented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jake L. Hamon</td>
<td>Vice-president</td>
<td>Cox and Hamon</td>
</tr>
<tr>
<td>John G. Pew</td>
<td>Vice-president</td>
<td>Sun Oil Company</td>
</tr>
<tr>
<td>Robert H. Colley</td>
<td>President</td>
<td>Atlantic Refining Company</td>
</tr>
<tr>
<td>Sidney A. Swensrud</td>
<td>Vice-president</td>
<td>Gulf Oil Corporation</td>
</tr>
<tr>
<td>L. S. Wescott</td>
<td>President</td>
<td>Pure Oil Company</td>
</tr>
<tr>
<td>John R. Sumner</td>
<td>Vice-President</td>
<td>Standard Oil (New Jersey)</td>
</tr>
<tr>
<td>H. S. M. Burns</td>
<td>President</td>
<td>Shell Union Oil Company</td>
</tr>
<tr>
<td>Frank Phillips</td>
<td>Chairman</td>
<td>Phillips Petroleum Company</td>
</tr>
<tr>
<td>W. Alton Jones</td>
<td>President</td>
<td>Cities Service Company</td>
</tr>
<tr>
<td>Lacey Walker</td>
<td>Secretary</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>William R. Boyd</td>
<td>President</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>Walter S. Hallanan</td>
<td>President</td>
<td>Plymouth Oil Company</td>
</tr>
<tr>
<td>Paul G. Blaser</td>
<td>Chairman</td>
<td>Ashland Oil &amp; Refining Company</td>
</tr>
<tr>
<td>John M. Lovejoy</td>
<td>President</td>
<td>Seaboard Oil Company</td>
</tr>
<tr>
<td>Charles S. Jones</td>
<td>President</td>
<td>Richfield Oil Company</td>
</tr>
<tr>
<td>W. L. Stewart, Jr.</td>
<td>Vice-president</td>
<td>Union Oil of California</td>
</tr>
<tr>
<td>N. C. McGowen</td>
<td>President</td>
<td>United Gas Pipe Line Company</td>
</tr>
<tr>
<td>G. D. Donnell</td>
<td>President</td>
<td>Ohio Oil Company</td>
</tr>
<tr>
<td>Robert E. Wilson</td>
<td>Chairman</td>
<td>Standard Oil of Indiana</td>
</tr>
</tbody>
</table>

1 Subsidiary of Pure Oil Company.

2 Subsidiary of Consolidated and Cities Service Companies.

<table>
<thead>
<tr>
<th>Name</th>
<th>Company/Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Franklin Waltman, Chairman</td>
<td>Sun Oil Company</td>
</tr>
<tr>
<td>Fred Eldean</td>
<td>Eldean Agency</td>
</tr>
<tr>
<td>George Prevermuth</td>
<td>Standard Oil (N. J.)</td>
</tr>
<tr>
<td>John P. Cohane</td>
<td>Advertising Agency</td>
</tr>
<tr>
<td>Jay S. Smith</td>
<td>Standard Oil of California</td>
</tr>
<tr>
<td>Don. Gilman</td>
<td>Western Oil and Gas Assn.</td>
</tr>
<tr>
<td>H. L. Curtis</td>
<td>Shell Union Oil Company</td>
</tr>
<tr>
<td>John Wieland</td>
<td>Standard Oil of Ohio</td>
</tr>
<tr>
<td>John S. Cooke</td>
<td>Society, Am. Pet. Institute</td>
</tr>
<tr>
<td>Richard Rollins</td>
<td>Atlantic Refining</td>
</tr>
<tr>
<td>M. S. Hauser</td>
<td>Ohio Oil Company</td>
</tr>
<tr>
<td>W. R. Huber</td>
<td>Gulf Oil Corporation</td>
</tr>
<tr>
<td>Jack Clarke</td>
<td>Lion Oil Company</td>
</tr>
<tr>
<td>Charles Simons</td>
<td>Texas Mid-Continental</td>
</tr>
<tr>
<td>Philip C. Humphrey</td>
<td>Texas Corporation</td>
</tr>
<tr>
<td>Edwin W. Essing</td>
<td>Standard Oil (N. J.)</td>
</tr>
<tr>
<td>Ralph Champlin</td>
<td>Ethyl Corporation</td>
</tr>
<tr>
<td>Clarel B. Mapes</td>
<td>Mid-Continental Oil Company</td>
</tr>
<tr>
<td>Haines Finnel</td>
<td>Union Oil of California</td>
</tr>
<tr>
<td>John S. Dupree</td>
<td>Ivy Lee - T. J. Ross</td>
</tr>
</tbody>
</table>

Table 13

Costs of Petroleum Transportation per Ton-mile by Types and the Per cent Transported by Each

<table>
<thead>
<tr>
<th>Type of Transportation</th>
<th>Cost per Ton-mile</th>
<th>Ton-miles (000)</th>
<th>Per cent Transported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water; tankers &amp; barges</td>
<td>$0.00063</td>
<td>10,378,737</td>
<td>87.92</td>
</tr>
<tr>
<td>Pipe-line (crude)</td>
<td>$0.00577</td>
<td>744,175</td>
<td>6.30</td>
</tr>
<tr>
<td>Pipe-line (gasoline)</td>
<td>$0.00527</td>
<td>372,992</td>
<td>3.16</td>
</tr>
<tr>
<td>Railroad</td>
<td>$0.01640</td>
<td>244,358</td>
<td>2.07</td>
</tr>
<tr>
<td>Truck</td>
<td>$0.04873</td>
<td>64,220</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Source: Shuman, Petroleum Industry, Table 25, p. 100.
<table>
<thead>
<tr>
<th>Total Sales</th>
<th>100.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales to Major Company Competitors</td>
<td>3.3</td>
</tr>
<tr>
<td>Tank Car and Truck Sales to Jobbers</td>
<td>14.7</td>
</tr>
<tr>
<td>Tank Car Sales to Retail Distributors</td>
<td>1.4</td>
</tr>
<tr>
<td>Tank Wagon Sales to Retail Outlets</td>
<td>60.2</td>
</tr>
<tr>
<td>(Uncontrolled Service Stations - Independents)</td>
<td>(36.2)</td>
</tr>
<tr>
<td>(Uncontrolled Service Stations - Lessees)</td>
<td>(19.1)</td>
</tr>
<tr>
<td>(Company Controlled and Operated Retail Outlets)</td>
<td>(4.9)</td>
</tr>
<tr>
<td>Tank Car and Tank Wagon Sales to Commercial Consumer</td>
<td>14.6</td>
</tr>
<tr>
<td>Other Customers, not elsewhere classified</td>
<td>5.8</td>
</tr>
</tbody>
</table>

1 From reports of eight major companies, including five subsidiaries of Standard Oil Company (New Jersey)

Source: TNEC (Part 14A), computed from Table 39a, p. 7818.
Table 15

Filling Stations, Employees, and Employees per Station

<table>
<thead>
<tr>
<th>Filling Stations</th>
<th>Filling Station Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independents</td>
<td>230,460 Proprietors, unincorp. 231,475</td>
</tr>
<tr>
<td>Chains</td>
<td>10,291 Full time employees 235,527</td>
</tr>
<tr>
<td>Cooperatives</td>
<td>1,017 Part time employees 39,115</td>
</tr>
<tr>
<td>Other</td>
<td>90 Family workers 99,534</td>
</tr>
<tr>
<td>Total</td>
<td>241,858 Total 566,596</td>
</tr>
</tbody>
</table>

Employees per Filling Station

<table>
<thead>
<tr>
<th>Number Employees</th>
<th>Number Stations</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>115,199</td>
<td>47.6</td>
</tr>
<tr>
<td>1</td>
<td>72,615</td>
<td>30.0</td>
</tr>
<tr>
<td>2</td>
<td>27,397</td>
<td>11.3</td>
</tr>
<tr>
<td>(0-2)</td>
<td>(215,171)</td>
<td>(88.9)</td>
</tr>
<tr>
<td>3-5</td>
<td>21,328</td>
<td>8.9</td>
</tr>
<tr>
<td>6-9</td>
<td>3,347</td>
<td>1.6</td>
</tr>
<tr>
<td>10-19</td>
<td>1,066</td>
<td>0.5</td>
</tr>
<tr>
<td>20-99</td>
<td>146</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Wash.</th>
<th>Col.</th>
<th>N.O.</th>
<th>Port.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>2,434</td>
<td>531</td>
<td>508</td>
<td>532</td>
<td>863</td>
</tr>
<tr>
<td>Major, Owned &amp; operated</td>
<td>304</td>
<td>93</td>
<td>73</td>
<td>47</td>
<td>91</td>
</tr>
<tr>
<td>Major, Owned &amp; leased</td>
<td>669</td>
<td>199</td>
<td>222</td>
<td>78</td>
<td>170</td>
</tr>
<tr>
<td>Major, Leased &amp; re-leased</td>
<td>350</td>
<td>9</td>
<td>56</td>
<td>213</td>
<td>72</td>
</tr>
<tr>
<td>Major, Leased &amp; operated</td>
<td>16</td>
<td>-</td>
<td>1</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Independent, owned &amp; operated</td>
<td>1,095</td>
<td>230</td>
<td>156</td>
<td>190</td>
<td>519</td>
</tr>
<tr>
<td>Sold gasoline only of major</td>
<td>2,296</td>
<td>429</td>
<td>503</td>
<td>513</td>
<td>851</td>
</tr>
<tr>
<td>Sold motor oil only of major</td>
<td>2,011</td>
<td>387</td>
<td>366</td>
<td>438</td>
<td>820</td>
</tr>
<tr>
<td>Adv. products only of major</td>
<td>1,986</td>
<td>425</td>
<td>420</td>
<td>450</td>
<td>691</td>
</tr>
</tbody>
</table>

1 Washington, D. C.; Columbus, Ohio; New Orleans, Louisiana; Portland, Oregon.

Source: TEC (Part 15A), pp. 8745-8746.
Table 17

The Legal Relationship Between Suppliers and Retailers

1. Service station owned and operated on a salary basis by a marketing company:
   A. Selling the branded products of a fully or semi-integrated company that has distribution over a large area, usually referred to as nationally branded. (A common type of integrated company operation.)
   B. Selling a locally branded product, often well-known and of good public acceptance within the locality.

2. Service station owned by marketing company but leased to the dealer, who in turn is responsible for all operating costs, including wages and his own remuneration. The operator of this type of outlet usually received a guaranteed margin on gasoline, regardless of whether the price was normal or subnormal.

3. The so-called third-party operation, in which the marketing company leased land and improved it or leased improved property and then subleased the service station with improvements and equipment to a dealer who was not the lessor, which dealer operated it on the same basis as type 2.

4. The lease and agency service station was an operation in which the dealer owned the land, improvements, and equipment or may have leased the land and installed improvements and equipment. The dealer entered into written agreement with the oil company. One of these was the lease, whereby the station and facilities were leased to the oil company for a definite period for a flat rental or a rental based on gallonage sold. Another instrument appointed the dealer as an agent to sell the products of the supplying company. This agency contract usually stipulated that the dealer sell the products of the supplying company exclusively, and the agency was commonly called a "100-per cent account." Sometimes the supplying company furnished part or all of the dispensing equipment, and in such cases another contract was executed loaning the equipment to the dealer. When these three agreements were used, this arrangement was often called "a triple A" agreement, i.e., lease, agency, and loan.

5. Lease and license stations, except for the legal form of the contract (license) were for all practical purposes similar to lease and agency. (Type 4.)

6. Independent dealer owning and operating station with or without sales contract with supplier:
   A. 100-per cent account refinery branded. (Quite uncommon.)
Table 17 (continued)

B. Split pump; that is, the products of several suppliers sold at the same station, margins generally guaranteed but somewhat less than 100-per cent accounts, usually one-half cent less.

C. Individually branded stations - the majority of the so-called "independent" cut price stations were of this type.

7. Trackside service stations:
   A. Owned and operated by chain organizations.
   B. Individually owned and operated.

Type 7A is similar to Type 1, except for the physical layout and price policy, and 7B is similar to 6C. This type of station, usually located at a trackside and highway intersection or accessible to a trackside by pipeline connection, usually had storage capacity for full carloads of any of the principal products it sold. Most trackside service stations sold gasoline at a lower price than that obtained for nationally branded gasoline in the same area.

8. Cooperative service stations, as the name implies, generally owned by consumers and commonly selling an unbranded or locally branded product at regular prices and usually rebating patronage dividends to its members.

9. Garage service stations. The principal difference between this type of operation and that of others described was in the physical layout. The relationship to the supplier was like that of Types 1, 2, 4, 5, and 6 of operation. Where the station was of the lease and agency or lease and license type, usually only that part of the garage reserved for gasoline sales was rented. This same thing may also be said of parking lots.

10. Marine service stations, principally for the supply of motor boats, were commonly jobber operations, but many of these stations were operated at retail outlets similar to drive-in service stations. In physical layout, some were located on the water front, others on barges, or self-propelled small tankers. They usually sold at prevailing prices or higher. The affiliations with the supplying company varied from full company ownership and operation to so-called independents.

Another case of agency operation (is) where the operator is an agent of the supplying company but is not the owner of the land.

Since the date of this summary the most important development in the relationship between retailers and suppliers has been the widespread leasing to dealers of stations formerly owned and operated by integrated companies.

Table 18

Manufacturing Industries Ranked by Value of Products, 1939

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Value of Product ($000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Vehicles</td>
<td>4,039,931</td>
</tr>
<tr>
<td>Steel Works &amp; Rolling Mills</td>
<td>2,720,020</td>
</tr>
<tr>
<td>Meat-packing, Wholesales</td>
<td>2,648,326</td>
</tr>
<tr>
<td>Petroleum Refining</td>
<td>2,461,127</td>
</tr>
<tr>
<td>Bread &amp; Bakery Products</td>
<td>1,211,395</td>
</tr>
<tr>
<td>Cigarettes &amp; Cigars</td>
<td>1,198,502</td>
</tr>
<tr>
<td>Smelting, Non-ferrous Metals</td>
<td>956,572</td>
</tr>
<tr>
<td>Paper &amp; Paper-board Mills</td>
<td>933,016</td>
</tr>
<tr>
<td>Cotton, Woven Goods</td>
<td>917,855</td>
</tr>
<tr>
<td>Newspaper Pulp</td>
<td>910,189</td>
</tr>
<tr>
<td>Chemical (not included elsewhere)</td>
<td>839,750</td>
</tr>
<tr>
<td>Woolen &amp; Worsted Goods</td>
<td>734,673</td>
</tr>
<tr>
<td>Sawmills</td>
<td>698,468</td>
</tr>
<tr>
<td>Flour &amp; Other Grain Mills</td>
<td>649,943</td>
</tr>
</tbody>
</table>

Source: Census of Manufactures, 1939, Table 12, pp. 305-306.
Table 19

Number of Gainfully Employed in the United States: 1840-1947

<table>
<thead>
<tr>
<th>Year</th>
<th>Labor Force</th>
<th>Year</th>
<th>Labor Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>1840</td>
<td>4,796,000</td>
<td>1900</td>
<td>29,073,0001</td>
</tr>
<tr>
<td>1850</td>
<td>5,372,000</td>
<td>1910</td>
<td>36,167,000</td>
</tr>
<tr>
<td>1860</td>
<td>8,284,000</td>
<td>1920</td>
<td>41,614,000</td>
</tr>
<tr>
<td>1870</td>
<td>12,506,000</td>
<td>1930</td>
<td>48,830,000</td>
</tr>
<tr>
<td>1880</td>
<td>17,392,000</td>
<td>1940</td>
<td>52,789,000</td>
</tr>
<tr>
<td>1890</td>
<td>23,318,000</td>
<td>1947</td>
<td>60,000,0002</td>
</tr>
</tbody>
</table>

1 Represents 38.3 per cent of the population (75,995,000).
2 Represents 42.9 per cent of the population (144,000,000).

## Table 20

Distribution of Employed Persons in the Petroleum Industry by Industry Branch, 1939

<table>
<thead>
<tr>
<th>Industry Branch</th>
<th>Concerns</th>
<th>Total Employed</th>
<th>Prop. Off., Mgr.</th>
<th>Salary Workers</th>
<th>Wage Earners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>283,723</td>
<td>1,008,848</td>
<td>263,062</td>
<td>53,972</td>
<td>691,814</td>
</tr>
<tr>
<td>Production</td>
<td>8,984</td>
<td>177,592</td>
<td>7,170</td>
<td>33,071</td>
<td>137,351</td>
</tr>
<tr>
<td>Drilling, etc. (1)</td>
<td>7,096</td>
<td>130,653</td>
<td>5,445</td>
<td>27,918</td>
<td>97,290</td>
</tr>
<tr>
<td>Contractors (2)</td>
<td>1,888</td>
<td>46,939</td>
<td>1,725</td>
<td>5,153</td>
<td>40,061</td>
</tr>
<tr>
<td>Transportation</td>
<td>63</td>
<td>32,741</td>
<td>342</td>
<td>3,260</td>
<td>29,139</td>
</tr>
<tr>
<td>Pipe-line (3)</td>
<td>63</td>
<td>20,741</td>
<td>342</td>
<td>3,260</td>
<td>17,139</td>
</tr>
<tr>
<td>Marine (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refining</td>
<td>485</td>
<td>98,568</td>
<td>109</td>
<td>14,742</td>
<td>83,717</td>
</tr>
<tr>
<td>Refining (5)</td>
<td>485</td>
<td>87,691</td>
<td>109</td>
<td>14,742</td>
<td>72,840</td>
</tr>
<tr>
<td>Construction (6)</td>
<td></td>
<td>10,877</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>274,181</td>
<td>699,947</td>
<td>255,441</td>
<td>2,899</td>
<td>441,607</td>
</tr>
<tr>
<td>Wholesale (7)</td>
<td>32,323</td>
<td>133,411</td>
<td>23,966</td>
<td></td>
<td>109,445</td>
</tr>
<tr>
<td>Bulk stations</td>
<td>30,825</td>
<td>125,877</td>
<td>23,061</td>
<td></td>
<td>98,816</td>
</tr>
<tr>
<td>Limited Whsle.</td>
<td>1,275</td>
<td>7,347</td>
<td>817</td>
<td></td>
<td>6,530</td>
</tr>
<tr>
<td>Mfr. Branches</td>
<td>77</td>
<td>1,200</td>
<td></td>
<td></td>
<td>1,200</td>
</tr>
<tr>
<td>Agents &amp; Brokers</td>
<td>146</td>
<td>474</td>
<td>88</td>
<td></td>
<td>386</td>
</tr>
<tr>
<td>Distribution (8)</td>
<td></td>
<td>2,513</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail (9)</td>
<td>241,858</td>
<td>566,536</td>
<td>231,475</td>
<td>2,899</td>
<td>332,162</td>
</tr>
<tr>
<td>Independents</td>
<td>230,460</td>
<td>530,223</td>
<td>231,127</td>
<td></td>
<td>299,096</td>
</tr>
<tr>
<td>Chain</td>
<td>10,291</td>
<td>32,976</td>
<td>305</td>
<td>2,899</td>
<td>29,772</td>
</tr>
<tr>
<td>Other</td>
<td>1,107</td>
<td>3,337</td>
<td>43</td>
<td></td>
<td>3,294</td>
</tr>
</tbody>
</table>

(a) Probably includes duplications because integrated companies may submit reports for more than one branch.
(b) Average for 1939.
(c) Includes 325 field superintendents.
(d) Not available.
(e) Estimated from partial Interstate Commerce Commission figures given in Petroleum Almanac, p. 185.
(f) Includes 99,534 unpaid family workers.
(g) Estimated from data of 235 chain stores. (See (9) below for Source.

Sources:
2. Ibid., Table 22, p. 174.
4. Ibid., p. 201.
8. Same as (5) above.
Table 21

Distribution of Employed Workers of Petroleum Industry
by Branch of Industry and Region, 1940

<table>
<thead>
<tr>
<th>Regions</th>
<th>Total</th>
<th>Production</th>
<th>Refining</th>
<th>Pipe-line</th>
<th>Filling Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>787,278</td>
<td>183,619</td>
<td>178,019</td>
<td>17,536</td>
<td>408,104</td>
</tr>
<tr>
<td>Northeastern</td>
<td>142,228</td>
<td>12,752</td>
<td>50,891</td>
<td>976</td>
<td>77,609</td>
</tr>
<tr>
<td>North Central</td>
<td>213,558</td>
<td>29,229</td>
<td>37,959</td>
<td>5,206</td>
<td>141,164</td>
</tr>
<tr>
<td>Southern</td>
<td>317,300</td>
<td>110,934</td>
<td>63,941</td>
<td>10,259</td>
<td>132,166</td>
</tr>
<tr>
<td>Western</td>
<td>114,192</td>
<td>30,704</td>
<td>25,228</td>
<td>1,095</td>
<td>57,165</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>787,278</td>
<td>754,947</td>
<td>32,331</td>
</tr>
<tr>
<td>Production</td>
<td>183,619</td>
<td>178,522</td>
<td>5,097</td>
</tr>
<tr>
<td>Refining</td>
<td>178,019</td>
<td>164,794</td>
<td>13,225</td>
</tr>
<tr>
<td>Pipe-line</td>
<td>17,536</td>
<td>17,191</td>
<td>345</td>
</tr>
<tr>
<td>Filling Stations</td>
<td>408,104</td>
<td>394,440</td>
<td>13,664</td>
</tr>
<tr>
<td>Total White Workers</td>
<td>756,809</td>
<td>724,916</td>
<td>31,893</td>
</tr>
<tr>
<td>Production</td>
<td>182,489</td>
<td>177,418</td>
<td>5,071</td>
</tr>
<tr>
<td>Refining</td>
<td>172,597</td>
<td>159,431</td>
<td>13,166</td>
</tr>
<tr>
<td>Pipe-line</td>
<td>16,852</td>
<td>16,517</td>
<td>335</td>
</tr>
<tr>
<td>Filling Stations</td>
<td>384,871</td>
<td>371,550</td>
<td>13,321</td>
</tr>
<tr>
<td>Total Non-white Workers</td>
<td>30,469</td>
<td>30,031</td>
<td>438</td>
</tr>
<tr>
<td>Production</td>
<td>1,130</td>
<td>1,104</td>
<td>26</td>
</tr>
<tr>
<td>Refining</td>
<td>5,422</td>
<td>5,363</td>
<td>59</td>
</tr>
<tr>
<td>Pipe-line</td>
<td>23,233</td>
<td>22,890</td>
<td>343</td>
</tr>
<tr>
<td>Filling Stations</td>
<td>684</td>
<td>674</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 23

Age Distribution of Male Employed Workers of Petroleum Industry by Branch of Industry,* 1940

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Total</th>
<th>Production</th>
<th>Refining</th>
<th>Filling Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>737,756</td>
<td>178,522</td>
<td>164,794</td>
<td>394,440</td>
</tr>
<tr>
<td>14-15</td>
<td>831</td>
<td>10</td>
<td>14</td>
<td>807</td>
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<tr>
<td>16-17</td>
<td>7,024</td>
<td>208</td>
<td>103</td>
<td>6,713</td>
</tr>
<tr>
<td>18-19</td>
<td>25,563</td>
<td>1,511</td>
<td>1,364</td>
<td>22,688</td>
</tr>
<tr>
<td>20-24</td>
<td>108,963</td>
<td>15,759</td>
<td>14,045</td>
<td>79,159</td>
</tr>
<tr>
<td>25-34</td>
<td>248,915</td>
<td>57,881</td>
<td>53,101</td>
<td>137,933</td>
</tr>
<tr>
<td>35-44</td>
<td>180,815</td>
<td>55,233</td>
<td>50,430</td>
<td>75,152</td>
</tr>
<tr>
<td>45-54</td>
<td>105,002</td>
<td>32,468</td>
<td>31,711</td>
<td>40,823</td>
</tr>
<tr>
<td>55-59</td>
<td>29,118</td>
<td>8,309</td>
<td>8,103</td>
<td>12,706</td>
</tr>
<tr>
<td>60-64</td>
<td>18,050</td>
<td>4,618</td>
<td>4,245</td>
<td>9,187</td>
</tr>
<tr>
<td>65 and over</td>
<td>12,131</td>
<td>2,337</td>
<td>1,522</td>
<td>8,252</td>
</tr>
<tr>
<td>Under 20</td>
<td>33,418</td>
<td>1,729</td>
<td>1,481</td>
<td>30,208</td>
</tr>
<tr>
<td>55-64</td>
<td>47,168</td>
<td>12,927</td>
<td>12,348</td>
<td>21,893</td>
</tr>
<tr>
<td>65 and over</td>
<td>13,475</td>
<td>2,525</td>
<td>1,678</td>
<td>9,272</td>
</tr>
<tr>
<td>Median age</td>
<td>37.5</td>
<td>37.7</td>
<td>31.4</td>
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</tbody>
</table>

* Data for Pipe-line branch not available.

### Table 24

Age Distribution of Male Employed Workers*

of Selected Industry Groups, 1940

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Mining</th>
<th>Manufacturing</th>
<th>Retail Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>723,539</td>
<td>8,085,796</td>
<td>4,089,874</td>
</tr>
<tr>
<td>14-15</td>
<td>234</td>
<td>17,623</td>
<td>13,302</td>
</tr>
<tr>
<td>16-17</td>
<td>2,246</td>
<td>56,736</td>
<td>57,935</td>
</tr>
<tr>
<td>18-19</td>
<td>16,115</td>
<td>236,231</td>
<td>155,660</td>
</tr>
<tr>
<td>20-24</td>
<td>18,595</td>
<td>310,590</td>
<td>266,897</td>
</tr>
<tr>
<td>25-34</td>
<td>89,414</td>
<td>1,129,658</td>
<td>525,408</td>
</tr>
<tr>
<td>35-44</td>
<td>210,893</td>
<td>2,425,046</td>
<td>1,083,596</td>
</tr>
<tr>
<td>45-54</td>
<td>172,982</td>
<td>1,852,956</td>
<td>992,293</td>
</tr>
<tr>
<td>55-64</td>
<td>72,495</td>
<td>716,391</td>
<td>416,706</td>
</tr>
<tr>
<td>65-74</td>
<td>15,734</td>
<td>203,730</td>
<td>147,610</td>
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<tr>
<td>75 and over</td>
<td>1,212</td>
<td>21,768</td>
<td>21,286</td>
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</table>

* Petroleum workers excluded

Table 25

Age Distribution of Employed Male Workers in Petroleum Refining, 1930 and 1940

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>1930</th>
<th>1940</th>
</tr>
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<tr>
<td></td>
<td>163,458</td>
<td>164,794</td>
</tr>
<tr>
<td>Under 20</td>
<td>3.6</td>
<td>0.9</td>
</tr>
<tr>
<td>20-24</td>
<td>14.9</td>
<td>8.5</td>
</tr>
<tr>
<td>25-34</td>
<td>34.8</td>
<td>32.2</td>
</tr>
<tr>
<td>35-44</td>
<td>26.7</td>
<td>30.6</td>
</tr>
<tr>
<td>45-54</td>
<td>13.4</td>
<td>19.2</td>
</tr>
<tr>
<td>55-64</td>
<td>5.3</td>
<td>7.5</td>
</tr>
<tr>
<td>65 and over</td>
<td>1.3</td>
<td>1.0</td>
</tr>
</tbody>
</table>

1 15th Census of United States, 1930, Occupation Statistics, Vol. V, (Ch. 7) Gainful Workers by Industry and Occupation, Table 1, pp. 6-7.

Table 26
Distribution of Employed Male Workers in the Petroleum Industry by Industry Branch, Residence, Region and States, 1940

<table>
<thead>
<tr>
<th>Region and State</th>
<th>Production Total</th>
<th>Rural Urban</th>
<th>Rural Non-farm</th>
<th>Total Urban</th>
<th>Rural Non-farm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>177,148</td>
<td>74,507</td>
<td>81,426</td>
<td>177,872</td>
<td>129,277</td>
</tr>
<tr>
<td>Mass.</td>
<td>12,474</td>
<td>2,766</td>
<td>7,591</td>
<td>2,090</td>
<td>33,300</td>
</tr>
<tr>
<td>N. Y.</td>
<td>2,315</td>
<td>420</td>
<td>1,482</td>
<td>413</td>
<td>11,070</td>
</tr>
<tr>
<td>N. J.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>18,907</td>
</tr>
<tr>
<td>Pa.</td>
<td>10,132</td>
<td>2,346</td>
<td>6,109</td>
<td>1,677</td>
<td>20,556</td>
</tr>
<tr>
<td>N. Gen</td>
<td>28,149</td>
<td>11,422</td>
<td>11,375</td>
<td>5,352</td>
<td>41,193</td>
</tr>
<tr>
<td>Ohio</td>
<td>3,308</td>
<td>882</td>
<td>1,470</td>
<td>936</td>
<td>7,943</td>
</tr>
<tr>
<td>Ind.</td>
<td>1,058</td>
<td>437</td>
<td>408</td>
<td>213</td>
<td>7,786</td>
</tr>
<tr>
<td>Ill.</td>
<td>10,695</td>
<td>4,779</td>
<td>4,134</td>
<td>1,782</td>
<td>14,412</td>
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<tr>
<td>Mich.</td>
<td>3,025</td>
<td>1,079</td>
<td>1,276</td>
<td>670</td>
<td>2,951</td>
</tr>
<tr>
<td>Mo.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3,050</td>
</tr>
<tr>
<td>Kansas</td>
<td>10,063</td>
<td>4,245</td>
<td>4,087</td>
<td>1,731</td>
<td>5,051</td>
</tr>
<tr>
<td>Southern</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Md.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2,483</td>
</tr>
<tr>
<td>W. Va.</td>
<td>5,452</td>
<td>644</td>
<td>2,584</td>
<td>2,224</td>
<td>2,088</td>
</tr>
<tr>
<td>Ky.</td>
<td>2,587</td>
<td>452</td>
<td>923</td>
<td>1,154</td>
<td>1,610</td>
</tr>
<tr>
<td>Ala.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,634</td>
</tr>
<tr>
<td>Ark.</td>
<td>1,075</td>
<td>618</td>
<td>386</td>
<td>71</td>
<td>553</td>
</tr>
<tr>
<td>Miss.</td>
<td>1,263</td>
<td>918</td>
<td>270</td>
<td>75</td>
<td>-</td>
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<tr>
<td>La.</td>
<td>12,914</td>
<td>5,165</td>
<td>6,509</td>
<td>1,240</td>
<td>7,999</td>
</tr>
<tr>
<td>Okla.</td>
<td>27,762</td>
<td>13,418</td>
<td>10,482</td>
<td>3,862</td>
<td>8,963</td>
</tr>
<tr>
<td>Texas</td>
<td>54,611</td>
<td>23,251</td>
<td>27,181</td>
<td>4,179</td>
<td>34,821</td>
</tr>
<tr>
<td>Western</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wyo.</td>
<td>4,104</td>
<td>1,384</td>
<td>2,612</td>
<td>108</td>
<td>1,456</td>
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<tr>
<td>N. Mex.</td>
<td>3,060</td>
<td>1,539</td>
<td>1,461</td>
<td>60</td>
<td>-</td>
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<tr>
<td>Calif.</td>
<td>23,782</td>
<td>12,930</td>
<td>10,052</td>
<td>800</td>
<td>20,269</td>
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<table>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>785,960</td>
<td>181,860</td>
<td>178,420</td>
<td>17,420</td>
<td>407,700</td>
<td>378,260</td>
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<tr>
<td>Higher Managerial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel</td>
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<td>15,180</td>
<td>10,860</td>
<td>680</td>
<td>179,900</td>
<td>26,720</td>
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<tr>
<td>Foremen</td>
<td>21,580</td>
<td>10,820</td>
<td>6,440</td>
<td>1,980</td>
<td>340</td>
<td>21,240</td>
</tr>
<tr>
<td>Wage-earners</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skilled</td>
<td>453,540</td>
<td>129,280</td>
<td>97,160</td>
<td>12,320</td>
<td>214,780</td>
<td>238,760</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>337,680</td>
<td>93,680</td>
<td>43,100</td>
<td>3,080</td>
<td>197,820</td>
<td>139,680</td>
</tr>
<tr>
<td>Unskilled</td>
<td>40,340</td>
<td>100</td>
<td>24,960</td>
<td>4,740</td>
<td>10,540</td>
<td>29,800</td>
</tr>
<tr>
<td>Other Employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>104,220</td>
<td>26,580</td>
<td>62,520</td>
<td>2,440</td>
<td>12,680</td>
<td>91,540</td>
</tr>
<tr>
<td>Clerical</td>
<td>26,060</td>
<td>9,460</td>
<td>15,960</td>
<td>560</td>
<td>80</td>
<td>25,980</td>
</tr>
<tr>
<td>Protective</td>
<td>69,240</td>
<td>16,020</td>
<td>42,300</td>
<td>1,740</td>
<td>9,180</td>
<td>60,060</td>
</tr>
<tr>
<td>Service</td>
<td>3,360</td>
<td>460</td>
<td>2,580</td>
<td>100</td>
<td>220</td>
<td>3,140</td>
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<tr>
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<td>340</td>
<td>1,180</td>
<td>-</td>
<td>2,720</td>
<td>1,520</td>
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</table>
### Table 28

Comparison of Petroleum Industry Labor Force with Other U. S. Industries, 1940

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number</th>
<th>Per cent</th>
<th>Industry</th>
<th>Number</th>
<th>Per cent</th>
</tr>
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<tbody>
<tr>
<td>Manufacturing</td>
<td>10,573</td>
<td>100.0</td>
<td>Transportation</td>
<td>2,178</td>
<td>100.0</td>
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<tr>
<td>Iron &amp; Steel</td>
<td>1,263</td>
<td>11.9</td>
<td>Railroad</td>
<td>1,135</td>
<td>52.1</td>
</tr>
<tr>
<td>Textile Mills</td>
<td>1,170</td>
<td>11.1</td>
<td>Trucking</td>
<td>489</td>
<td>22.5</td>
</tr>
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<td>Food</td>
<td>1,094</td>
<td>10.3</td>
<td>Street Railway</td>
<td>203</td>
<td>9.3</td>
</tr>
<tr>
<td>Machinery</td>
<td>1,072</td>
<td>10.1</td>
<td>Water</td>
<td>181</td>
<td>8.3</td>
</tr>
<tr>
<td>Lumber</td>
<td>939</td>
<td>8.9</td>
<td>Other</td>
<td>129</td>
<td>5.9</td>
</tr>
<tr>
<td>Transp. Equipment</td>
<td>881</td>
<td>8.3</td>
<td>Air</td>
<td>23</td>
<td>1.1</td>
</tr>
<tr>
<td>Apparel</td>
<td>781</td>
<td>7.4</td>
<td>Pipe-line</td>
<td>18</td>
<td>0.8</td>
</tr>
<tr>
<td>Printing &amp; Pub.</td>
<td>631</td>
<td>6.0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Other Mfg.</td>
<td>550</td>
<td>5.2</td>
<td>Retail Trade</td>
<td>6,332</td>
<td>100.0</td>
</tr>
<tr>
<td>Chemical</td>
<td>440</td>
<td>4.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leather</td>
<td>364</td>
<td>3.4</td>
<td>Food</td>
<td>1,489</td>
<td>23.5</td>
</tr>
<tr>
<td>Stone, Glass</td>
<td>337</td>
<td>3.2</td>
<td>Eating &amp; Drinking</td>
<td>1,116</td>
<td>17.6</td>
</tr>
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<td>Paper</td>
<td>328</td>
<td>3.1</td>
<td>Other</td>
<td>841</td>
<td>13.3</td>
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<td>Non-ferrous Metals</td>
<td>279</td>
<td>2.6</td>
<td>Genl. Mdse.</td>
<td>803</td>
<td>12.7</td>
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<tr>
<td>Petroleum Refining</td>
<td>178</td>
<td>1.7</td>
<td>Apparel</td>
<td>489</td>
<td>7.7</td>
</tr>
<tr>
<td>Rubber</td>
<td>159</td>
<td>1.5</td>
<td>Filling Stations</td>
<td>408</td>
<td>6.6</td>
</tr>
<tr>
<td>Tobacco</td>
<td>107</td>
<td>1.0</td>
<td>Hardware</td>
<td>362</td>
<td>5.7</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Motor Vehicles</td>
<td>331</td>
<td>5.2</td>
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<tr>
<td>Mining</td>
<td>913</td>
<td>100.0</td>
<td>Furniture</td>
<td>257</td>
<td>4.2</td>
</tr>
<tr>
<td>Coal Mining</td>
<td>527</td>
<td>97.7</td>
<td>Drugs</td>
<td>225</td>
<td>3.6</td>
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<tr>
<td>Petroleum Production</td>
<td>184</td>
<td>20.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals</td>
<td>117</td>
<td>12.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>85</td>
<td>9.3</td>
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</tr>
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</table>

Table 29

Petroleum Drilling and Production Contractors, 1939

<table>
<thead>
<tr>
<th>Operations</th>
<th>Concerns</th>
<th>Total</th>
<th>Proprietors</th>
<th>Salary Workers</th>
<th>Wage Earners</th>
<th>Working Prop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,888</td>
<td>46,939</td>
<td>1,725</td>
<td>5,153</td>
<td>40,061</td>
<td>637</td>
</tr>
<tr>
<td>Drilling wells</td>
<td>985</td>
<td>25,086</td>
<td>862</td>
<td>1,676</td>
<td>22,548</td>
<td>292</td>
</tr>
<tr>
<td>Haul. supplies &amp; equipment</td>
<td>172</td>
<td>4,290</td>
<td>197</td>
<td>343</td>
<td>3,750</td>
<td>73</td>
</tr>
<tr>
<td>Build., repair., rigs</td>
<td>115</td>
<td>3,847</td>
<td>111</td>
<td>258</td>
<td>3,478</td>
<td>44</td>
</tr>
<tr>
<td>Run., cut., pull., tubes</td>
<td>98</td>
<td>1,025</td>
<td>104</td>
<td>56</td>
<td>865</td>
<td>41</td>
</tr>
<tr>
<td>Machine, repair shops</td>
<td>97</td>
<td>1,461</td>
<td>102</td>
<td>207</td>
<td>1,152</td>
<td>57</td>
</tr>
<tr>
<td>General servicing</td>
<td>83</td>
<td>1,896</td>
<td>90</td>
<td>111</td>
<td>1,692</td>
<td>24</td>
</tr>
<tr>
<td>Exploration, surveying</td>
<td>76</td>
<td>4,317</td>
<td>46</td>
<td>1,667</td>
<td>2,607</td>
<td>18</td>
</tr>
<tr>
<td>Excavate pits, foundation</td>
<td>73</td>
<td>925</td>
<td>87</td>
<td>32</td>
<td>806</td>
<td>32</td>
</tr>
<tr>
<td>Cleaning, swabbing wells</td>
<td>37</td>
<td>618</td>
<td>30</td>
<td>55</td>
<td>533</td>
<td>5</td>
</tr>
<tr>
<td>Shooting wells</td>
<td>34</td>
<td>351</td>
<td>13</td>
<td>81</td>
<td>257</td>
<td>11</td>
</tr>
<tr>
<td>Erect., repair., tanks</td>
<td>33</td>
<td>707</td>
<td>26</td>
<td>67</td>
<td>614</td>
<td>13</td>
</tr>
<tr>
<td>Cementing wells</td>
<td>23</td>
<td>1,051</td>
<td>11</td>
<td>202</td>
<td>838</td>
<td>9</td>
</tr>
<tr>
<td>Drilling water wells</td>
<td>22</td>
<td>162</td>
<td>25</td>
<td>12</td>
<td>125</td>
<td>11</td>
</tr>
<tr>
<td>Install., equipment</td>
<td>12</td>
<td>156</td>
<td>10</td>
<td>4</td>
<td>142</td>
<td>1</td>
</tr>
<tr>
<td>Perforate well casing</td>
<td>10</td>
<td>499</td>
<td>1</td>
<td>204</td>
<td>294</td>
<td>1</td>
</tr>
<tr>
<td>Acidizing, treating</td>
<td>10</td>
<td>374</td>
<td>5</td>
<td>167</td>
<td>202</td>
<td>3</td>
</tr>
<tr>
<td>Operate, maintain wells</td>
<td>8</td>
<td>174</td>
<td>5</td>
<td>11</td>
<td>158</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table 30

Distribution of Technical Employees in Petroleum Industry

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>All technical employees</td>
<td>8,078</td>
<td>100.0</td>
</tr>
<tr>
<td>Chemists</td>
<td>1,398</td>
<td>17.3</td>
</tr>
<tr>
<td>Research</td>
<td>484</td>
<td>6.0</td>
</tr>
<tr>
<td>Analytical, other</td>
<td>914</td>
<td>11.3</td>
</tr>
<tr>
<td>Engineers</td>
<td>3,097</td>
<td>38.3</td>
</tr>
<tr>
<td>Chemical</td>
<td>776</td>
<td>9.6</td>
</tr>
<tr>
<td>Civil, field</td>
<td>331</td>
<td>4.1</td>
</tr>
<tr>
<td>Mechanical</td>
<td>718</td>
<td>8.9</td>
</tr>
<tr>
<td>Process</td>
<td>530</td>
<td>6.5</td>
</tr>
<tr>
<td>Other</td>
<td>742</td>
<td>9.2</td>
</tr>
<tr>
<td>Geologists, geophysicists</td>
<td>263</td>
<td>3.3</td>
</tr>
<tr>
<td>Observers, computers</td>
<td>285</td>
<td>3.5</td>
</tr>
<tr>
<td>Party chiefs, surveyors</td>
<td>354</td>
<td>4.4</td>
</tr>
<tr>
<td>Supervisors</td>
<td>2,256</td>
<td>27.9</td>
</tr>
<tr>
<td>Laboratory</td>
<td>625</td>
<td>7.7</td>
</tr>
<tr>
<td>Process, production</td>
<td>1,631</td>
<td>20.2</td>
</tr>
<tr>
<td>Other</td>
<td>425</td>
<td>5.3</td>
</tr>
</tbody>
</table>

1 At least 25 per cent of all employees in petroleum laboratories in the country are included.

Source: Monthly Labor Review LVIII (May 1944), Table 3, p. 971.
Table 31

<table>
<thead>
<tr>
<th>Year</th>
<th>Injury Index</th>
<th>Frequency Rate</th>
<th>Severity Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1936</td>
<td>132.64</td>
<td>25.60</td>
<td>96.74</td>
</tr>
<tr>
<td>1937</td>
<td>119.20</td>
<td>22.41</td>
<td>51.70</td>
</tr>
<tr>
<td>1938</td>
<td>93.91</td>
<td>23.38</td>
<td>49.51</td>
</tr>
<tr>
<td>1939</td>
<td>112.12</td>
<td>22.46</td>
<td>45.92</td>
</tr>
<tr>
<td>1940</td>
<td>83.53</td>
<td>22.55</td>
<td>40.03</td>
</tr>
<tr>
<td>1941</td>
<td>113.30</td>
<td>26.25</td>
<td>43.70</td>
</tr>
<tr>
<td>1942</td>
<td>74.68</td>
<td>20.87</td>
<td>46.28</td>
</tr>
<tr>
<td>1943</td>
<td>104.59</td>
<td>24.25</td>
<td>53.99</td>
</tr>
<tr>
<td>1944</td>
<td>135.24</td>
<td>28.72</td>
<td>65.84</td>
</tr>
<tr>
<td>1945</td>
<td>169.83</td>
<td>22.98</td>
<td>74.73</td>
</tr>
</tbody>
</table>

1 Injury index is the frequency rate plus severity rate per 10,000 hours worked.

2 Frequency rate is the number of disabling injuries per million hours worked.

3 Severity rate is the number of days lost per 1,000 hours worked.

<table>
<thead>
<tr>
<th>Months</th>
<th>Petroleum Production</th>
<th>Petroleum Refining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>112,961</td>
<td>62,369</td>
</tr>
<tr>
<td>No Work</td>
<td>2,661</td>
<td>1,105</td>
</tr>
<tr>
<td>1-2</td>
<td>2,915</td>
<td>612</td>
</tr>
<tr>
<td>3-5</td>
<td>8,046</td>
<td>1,523</td>
</tr>
<tr>
<td>6-8</td>
<td>14,273</td>
<td>2,951</td>
</tr>
<tr>
<td>9-11</td>
<td>13,398</td>
<td>3,787</td>
</tr>
<tr>
<td>12</td>
<td>70,520</td>
<td>52,120</td>
</tr>
<tr>
<td>Unreported</td>
<td>1,148</td>
<td>281</td>
</tr>
</tbody>
</table>

**Average Months**: 10.0 | 11.1

Table 33
Average Hourly Wage Rates for
Refining Branch of Petroleum Industry, 1943

<table>
<thead>
<tr>
<th>Occupations</th>
<th>Av. Wages</th>
<th>Total Empl.</th>
<th>Under $.80</th>
<th>$.80-1.00</th>
<th>$1.00-1.19</th>
<th>$1.20-1.39</th>
<th>$1.40 &amp; Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>10,583</td>
<td>723</td>
<td>1,405</td>
<td>2,629</td>
<td>4,412</td>
<td>1,351</td>
<td></td>
</tr>
<tr>
<td>Per cent</td>
<td>100.0</td>
<td>6.8</td>
<td>13.3</td>
<td>25.4</td>
<td>41.7</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td>Electricians</td>
<td>1.37</td>
<td>221</td>
<td>-</td>
<td>3</td>
<td>15</td>
<td>82</td>
<td>121</td>
</tr>
<tr>
<td>Machinists</td>
<td>1.36</td>
<td>460</td>
<td>-</td>
<td>2</td>
<td>23</td>
<td>278</td>
<td>157</td>
</tr>
<tr>
<td>Stillmen, cracking</td>
<td>1.36</td>
<td>463</td>
<td>2</td>
<td>21</td>
<td>67</td>
<td>119</td>
<td>254</td>
</tr>
<tr>
<td>Welders</td>
<td>1.34</td>
<td>460</td>
<td>-</td>
<td>2</td>
<td>32</td>
<td>287</td>
<td>139</td>
</tr>
<tr>
<td>Carpenters</td>
<td>1.32</td>
<td>124</td>
<td>-</td>
<td>2</td>
<td>21</td>
<td>59</td>
<td>42</td>
</tr>
<tr>
<td>Pipefitters</td>
<td>1.32</td>
<td>319</td>
<td>-</td>
<td>7</td>
<td>43</td>
<td>195</td>
<td>74</td>
</tr>
<tr>
<td>Stillmen, other</td>
<td>1.25</td>
<td>712</td>
<td>66</td>
<td>64</td>
<td>83</td>
<td>184</td>
<td>315</td>
</tr>
<tr>
<td>Treaters</td>
<td>1.24</td>
<td>393</td>
<td>15</td>
<td>32</td>
<td>103</td>
<td>148</td>
<td>95</td>
</tr>
<tr>
<td>Pumpers</td>
<td>1.22</td>
<td>858</td>
<td>39</td>
<td>73</td>
<td>140</td>
<td>559</td>
<td>47</td>
</tr>
<tr>
<td>Stillmen, helper 1</td>
<td>1.19</td>
<td>988</td>
<td>28</td>
<td>55</td>
<td>252</td>
<td>629</td>
<td>24</td>
</tr>
<tr>
<td>Electricians (B)</td>
<td>1.18</td>
<td>102</td>
<td>1</td>
<td>3</td>
<td>33</td>
<td>65</td>
<td>-</td>
</tr>
<tr>
<td>Machinists (B)</td>
<td>1.18</td>
<td>251</td>
<td>2</td>
<td>6</td>
<td>94</td>
<td>149</td>
<td>-</td>
</tr>
<tr>
<td>Treater, helper</td>
<td>1.17</td>
<td>313</td>
<td>15</td>
<td>39</td>
<td>35</td>
<td>224</td>
<td>-</td>
</tr>
<tr>
<td>Pipefitter (B)</td>
<td>1.15</td>
<td>307</td>
<td>12</td>
<td>26</td>
<td>79</td>
<td>190</td>
<td>-</td>
</tr>
<tr>
<td>Pumpers, helper</td>
<td>1.15</td>
<td>471</td>
<td>22</td>
<td>27</td>
<td>296</td>
<td>126</td>
<td>-</td>
</tr>
<tr>
<td>Carpenters (B)</td>
<td>1.15</td>
<td>58</td>
<td>-</td>
<td>4</td>
<td>47</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Stillmen, helper 2</td>
<td>1.13</td>
<td>410</td>
<td>35</td>
<td>45</td>
<td>101</td>
<td>229</td>
<td>-</td>
</tr>
<tr>
<td>Still firemen</td>
<td>1.13</td>
<td>536</td>
<td>23</td>
<td>49</td>
<td>195</td>
<td>265</td>
<td>-</td>
</tr>
<tr>
<td>Welders (B)</td>
<td>1.09</td>
<td>155</td>
<td>6</td>
<td>20</td>
<td>76</td>
<td>33</td>
<td>-</td>
</tr>
<tr>
<td>Routine testers</td>
<td>1.07</td>
<td>681</td>
<td>52</td>
<td>157</td>
<td>187</td>
<td>285</td>
<td>-</td>
</tr>
<tr>
<td>Guards</td>
<td>.93</td>
<td>944</td>
<td>182</td>
<td>422</td>
<td>340</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Truck Drivers</td>
<td>.91</td>
<td>425</td>
<td>95</td>
<td>98</td>
<td>231</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>1.06</td>
<td>932</td>
<td>128</td>
<td>248</td>
<td>199</td>
<td>274</td>
<td>83</td>
</tr>
</tbody>
</table>

Average Wage: 1.16

Table 34

Average Hourly Wage Rates for
Production Branch of Petroleum Industry, 1943

<table>
<thead>
<tr>
<th>Occupations</th>
<th>Av. Wage</th>
<th>Total Empl.</th>
<th>Under $.80</th>
<th>$.80 - .99</th>
<th>$1.00 - 1.19</th>
<th>$1.20 - 1.39</th>
<th>$1.40 &amp; Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td></td>
<td>21,805</td>
<td>2,590</td>
<td>6,703</td>
<td>10,443</td>
<td>785</td>
<td>1,284</td>
</tr>
<tr>
<td>Per cent</td>
<td>100.0</td>
<td>11.9</td>
<td>30.7</td>
<td>47.9</td>
<td>3.6</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>Drillers, rotary</td>
<td>1.52</td>
<td>1,353</td>
<td>-</td>
<td>1</td>
<td>32</td>
<td>134</td>
<td>1,186</td>
</tr>
<tr>
<td>Machinists</td>
<td>1.33</td>
<td>18</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Electricians</td>
<td>1.31</td>
<td>25</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Carpenters</td>
<td>1.19</td>
<td>25</td>
<td>-</td>
<td>1</td>
<td>11</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>Gang pushers</td>
<td>1.17</td>
<td>947</td>
<td>29</td>
<td>69</td>
<td>502</td>
<td>294</td>
<td>53</td>
</tr>
<tr>
<td>Drillers, cable</td>
<td>1.15</td>
<td>198</td>
<td>-</td>
<td>6</td>
<td>128</td>
<td>52</td>
<td>12</td>
</tr>
<tr>
<td>Electricians (B)</td>
<td>1.05</td>
<td>15</td>
<td>-</td>
<td>8</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Carpenters (B)</td>
<td>1.03</td>
<td>41</td>
<td>5</td>
<td>6</td>
<td>30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Derrickmen</td>
<td>1.03</td>
<td>1,012</td>
<td>8</td>
<td>425</td>
<td>410</td>
<td>169</td>
<td>-</td>
</tr>
<tr>
<td>Firemen</td>
<td>1.03</td>
<td>785</td>
<td>-</td>
<td>321</td>
<td>446</td>
<td>18</td>
<td>-</td>
</tr>
<tr>
<td>Maintenance</td>
<td>1.00</td>
<td>167</td>
<td>40</td>
<td>40</td>
<td>56</td>
<td>51</td>
<td>-</td>
</tr>
<tr>
<td>Pumpsers, switchers</td>
<td>.99</td>
<td>7,945</td>
<td>983</td>
<td>2,063</td>
<td>4,839</td>
<td>52</td>
<td>3</td>
</tr>
<tr>
<td>Floormen</td>
<td>.99</td>
<td>1,836</td>
<td>16</td>
<td>1,216</td>
<td>604</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Roustabouts</td>
<td>.94</td>
<td>5,271</td>
<td>1,181</td>
<td>1,242</td>
<td>2,848</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Floormen, helpers</td>
<td>.93</td>
<td>1,539</td>
<td>60</td>
<td>1,195</td>
<td>284</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Truck drivers</td>
<td>.92</td>
<td>480</td>
<td>138</td>
<td>99</td>
<td>225</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Watchmen</td>
<td>.63</td>
<td>148</td>
<td>125</td>
<td>11</td>
<td>12</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Average Wage</td>
<td>1.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 35

Average Hours, Hourly Wage-rates, and Weekly Wage Earnings in the Petroleum Production and Refining Branches

<table>
<thead>
<tr>
<th>Year</th>
<th>Petroleum Production Average</th>
<th>Petroleum Refining Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weekly Hours</td>
<td>Hourly Wages</td>
</tr>
<tr>
<td>1935</td>
<td>36.5</td>
<td>$0.78</td>
</tr>
<tr>
<td>1936</td>
<td>38.9</td>
<td>0.76</td>
</tr>
<tr>
<td>1937</td>
<td>39.9</td>
<td>0.83</td>
</tr>
<tr>
<td>1938</td>
<td>39.9</td>
<td>0.84</td>
</tr>
<tr>
<td>1939</td>
<td>37.7</td>
<td>0.88</td>
</tr>
<tr>
<td>1940</td>
<td>38.3</td>
<td>0.88</td>
</tr>
<tr>
<td>1941</td>
<td>37.8</td>
<td>0.97</td>
</tr>
<tr>
<td>1942</td>
<td>39.8</td>
<td>1.04</td>
</tr>
<tr>
<td>1943</td>
<td>44.3</td>
<td>1.12</td>
</tr>
<tr>
<td>1944</td>
<td>44.9</td>
<td>1.16</td>
</tr>
<tr>
<td>1945</td>
<td>44.1</td>
<td>1.19</td>
</tr>
<tr>
<td>1946</td>
<td>41.2</td>
<td>1.31</td>
</tr>
<tr>
<td>1947</td>
<td>40.0</td>
<td>1.49</td>
</tr>
<tr>
<td>1948</td>
<td>39.9</td>
<td>1.63</td>
</tr>
</tbody>
</table>

* Month of October for all years but 1948, the latter is for the month of January.

Table 36
An Outline of Some Stages in Finding and Drilling for Oil,
and Some Specialized Services Utilized

A. Exploratory Work:

1. A geologic survey, using the gravimeter or magnometer, to determine any abnormal underground structures. This service performed by special companies who provide geological crews, would indicate only in a general way that there is an abnormal or "high" structure. The next step is to locate the position of the "high" structure.

2. The "high" underground structure can be located by a seismograph company. A seismograph is employed to "shoot" your land with underground charges, and to record the rate with which sound waves travel back from the various structures; thus, locating the "high" or "dome" structure. The seismograph does not locate the presence of oil, it merely furnishes clues that there are structures where oil may be trapped, and indicates the depth at which the structure is located, say at 7500 feet in a certain location.

3. The next step is to hire a consultant geologist who will interpret further the seismograph readings, and, in light of his knowledge and experience concerning the geological formations and previous drilling experiences of the area, he will give you his opinion that your chances of finding oil are good.

4. You then obtain a drilling permit from the State Conservation Department, or from whatever state agency is authorized to issue such a permit.

B. Pre-drilling Preparations

1. A drilling contractor usually is hired to supervise the work of preparing the site and of drilling the well. His contract includes the cost of drilling operations, and the authority to employ, at your expense, the following services required to prepare for drilling operations.

2. A general contractor is hired to clear and make a road to the oil-well site, to dig slush pits, build pipe racks, to bring in a supply of fresh water, and to do other work of a general nature.

3. A drilling rig concern is hired to erect, and later to remove, the derrick.
4. A hauling concern will be employed to bring to the well the needed heavy field equipment of boilers, drilling tools, etc.

C. The Drilling Operations

1. The consultant geologist or a petroleum engineer is hired to remain with the drilling operations, and to supervise the technical work. He will make decisions as to the rate at which and the depth to which the well is to be drilled. He will make core analyses, and, when necessary, will be authorized:
   a. To send drilling cores to special laboratory concerns for analysis which cannot be made in the field;
   b. To call in an electric well-logging concern to "read" the well in order to determine the nature of the various strata of sand, shale, rock, limestone, etc., and to learn the approximate thickness of the layers;
   c. or, in lieu of the electric well-logging concern, he may wish to employ the services of a radioactive well-logging process which performs the same services generally as the electric well-logging, except that it uses a gamma ray;
   d. He may also use the radioactive concern to determine the fluid content of a sand structure by means of a neutron ray.

2. The drilling contractor will have to obtain pipe and other needed supplies from an oil-field equipment supply house.

3. In the use of the rotary drill, a drilling-mud concern will be called upon to ascertain the particular requirements for the drilling operation and will supply the special mud.

4. When the well reaches the oil pool, or if for some reason, prior to reaching the oil pool, the well is to be cemented, a special company will have to be utilized to perform that service because of their patent rights to the process.

5. After the well has been shut off with cement, another company specializing in gun perforation work is required to penetrate the casing to permit drilling operations to be resumed.

D. Post-drilling Operations

1. Storage tanks and separators will be needed and must be purchased and installed from concerns specializing in the manufacture of such equipment.

2. Facilities will have to be provided for getting your oil to the refinery; either
   a. A pipe-line will have to be constructed to the gathering point of the refinery, or
Table 36 (continued)

b. Trucks hired to transport to the gathering point.

3. After a period of initial flow, the State Department of Conservation will determine, from various factors, the rate of flow to be permitted from the well; its so-called pro-rated "allowable."

4. Someone will have to be hired to check the gauges to see that the well maintains its allowable flow.

Sources: Leven, Done in Oil; Ball, This Fascinating Oil Business; Professor James Morgan, School of Geology, Louisiana State University.
Table 37
Comparison of Financial Reports of
Standard Oil Company (New Jersey) 1946 and 1947

<table>
<thead>
<tr>
<th>Description</th>
<th>1947</th>
<th>1946</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARNED HER SHARE</td>
<td>Up 51% $9.83</td>
<td>$6.50</td>
</tr>
<tr>
<td>Total Income</td>
<td>Up 45% $2,386,661,911</td>
<td>$1,644,812,356</td>
</tr>
<tr>
<td>Operating Expenses and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordinary Taxes</td>
<td>43% 1,780,043,520</td>
<td>1,243,935,462</td>
</tr>
<tr>
<td>Depreciation &amp; Depletion</td>
<td>19% 143,003,089</td>
<td>120,005,574</td>
</tr>
<tr>
<td>Profits Before Federal Income Taxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Taxes</td>
<td>61% 403,626,580</td>
<td>250,606,931</td>
</tr>
<tr>
<td>NET PROFITS</td>
<td>51% 268,626,580</td>
<td>177,609,931</td>
</tr>
<tr>
<td>Dividends</td>
<td>33% 109,334,968</td>
<td>82,001,226</td>
</tr>
<tr>
<td>Undistributed Profits</td>
<td>67% 159,291,612</td>
<td>95,608,705</td>
</tr>
<tr>
<td>Total Assets</td>
<td>12½% 2,995,989,693</td>
<td>2,659,987,889</td>
</tr>
<tr>
<td>Property Acct.</td>
<td>19½% 1,524,122,335</td>
<td>1,274,429,578</td>
</tr>
<tr>
<td>Current Assets</td>
<td>7.5% 1,100,562,987</td>
<td>1,023,080,393</td>
</tr>
<tr>
<td>Oil Inventories</td>
<td>3% 163,060,953</td>
<td>158,604,483</td>
</tr>
<tr>
<td>Other Inventories</td>
<td>40% 188,023,223</td>
<td>134,438,846</td>
</tr>
<tr>
<td>Accts. &amp; Notes Rec.</td>
<td>42% 283,378,220</td>
<td>198,029,925</td>
</tr>
<tr>
<td>Capital Stock</td>
<td>683,343,550</td>
<td>683,343,550</td>
</tr>
<tr>
<td>Capital Surplus</td>
<td>64,002,810</td>
<td>60,968,006</td>
</tr>
<tr>
<td>Earned Surplus</td>
<td>Up 17½% 1,070,476,126</td>
<td>911,010,079</td>
</tr>
<tr>
<td>NET WORTH</td>
<td>Up 9½% $1,817,822,486</td>
<td>$1,655,321,635</td>
</tr>
</tbody>
</table>

Source: Annual Report for 1947, Standard Oil Company (New Jersey)
Table 38  
Subsidiaries of Standard Oil Company (New Jersey)

<table>
<thead>
<tr>
<th>Subsidiary</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>100% VOTING CONTROL IN THE FOLLOWING:</strong></td>
<td></td>
</tr>
<tr>
<td>Carter Oil Co., W. Va. - Producing</td>
<td>Producing</td>
</tr>
<tr>
<td>Leader Oil Co.</td>
<td></td>
</tr>
<tr>
<td>Powerine Co. - Distributes oils and gasoline in</td>
<td>Rocky Mt. area.</td>
</tr>
<tr>
<td>Minnelusa Oil Corp. - Inactive</td>
<td></td>
</tr>
<tr>
<td>Gilbert &amp; Barker Mfg. Co., Ltd.</td>
<td></td>
</tr>
<tr>
<td>Hope Producing Co. - Producing natural gas</td>
<td></td>
</tr>
<tr>
<td>International Co.</td>
<td></td>
</tr>
<tr>
<td>Portland Pipe Line Co. - Operates pipeline</td>
<td>Operates pipeline from Portland, Me. to Canadian</td>
</tr>
<tr>
<td>Stanco Incorporated - Manufactures flit and</td>
<td>nujol.</td>
</tr>
<tr>
<td>Standard Alcohol Co. - Manufactures alcohol</td>
<td></td>
</tr>
<tr>
<td>Standard Oil Co. of N. J. (Del.).</td>
<td></td>
</tr>
<tr>
<td>Esso Incorporated</td>
<td></td>
</tr>
<tr>
<td>Interstate Oil Pipe Line Co. (58.10%) - Operates</td>
<td>pipe lines in Oklahoma and Louisiana</td>
</tr>
<tr>
<td>Penola, Inc.</td>
<td></td>
</tr>
<tr>
<td>Standard Oil Co. of Pa. (17.79%) - Marketing</td>
<td></td>
</tr>
<tr>
<td>Standard Oil Co. of Pa. (82.21%) - Marketing</td>
<td></td>
</tr>
<tr>
<td>Tuscarora Oil Co., Ltd. (99.96%), Pa. - Pipelines</td>
<td></td>
</tr>
<tr>
<td>Standard Oil Development Co. - Research</td>
<td></td>
</tr>
<tr>
<td>Hydro Engineering &amp; Chemical Co.</td>
<td></td>
</tr>
<tr>
<td>Standard Oil Export Corp. - Inactive</td>
<td></td>
</tr>
<tr>
<td>Oil Co. - N. J.</td>
<td></td>
</tr>
<tr>
<td><strong>LESS THAN 100% VOTING CONTROL:</strong></td>
<td></td>
</tr>
<tr>
<td>Colonial Beacon Oil Co. (99.96%), Mass. - Refining</td>
<td>Marketing</td>
</tr>
<tr>
<td>Kenbec, Inc. (75.0%)</td>
<td></td>
</tr>
<tr>
<td>Sylvestre Utilities Co., Ind. (68.99%), Del. -</td>
<td>Holding Company</td>
</tr>
<tr>
<td>Sylvestre Oil Co., Inc. (92.72%), N. Y. -</td>
<td>Marketing</td>
</tr>
<tr>
<td>Creole Petroleum Corp. (93.14%), Del. - Producing</td>
<td>Marketing</td>
</tr>
<tr>
<td>Humble Oil &amp; Refining Co. (71.90%) - Texas,</td>
<td>Producing, Refining &amp; Marketing</td>
</tr>
<tr>
<td>Imperial Oil Refineries, Ltd.</td>
<td></td>
</tr>
<tr>
<td>Imperial Oil Shipping Co., Ltd. - Tankers</td>
<td></td>
</tr>
<tr>
<td>Company Name</td>
<td>Ownership Percentage</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Imperial Pipe Line Co., Ltd.</td>
<td></td>
</tr>
<tr>
<td>Ioco Townsite, Ltd.</td>
<td></td>
</tr>
<tr>
<td>Lowery Petroleums, Ltd.</td>
<td></td>
</tr>
<tr>
<td>Maple Leaf Petroleum Ltd.</td>
<td></td>
</tr>
<tr>
<td>Norcanols Oil &amp; Gas, Ltd. (91.77%)</td>
<td></td>
</tr>
<tr>
<td>Northwest Co., Ltd. - Inactive</td>
<td></td>
</tr>
<tr>
<td>Oil Transport Securities, Ltd. - N. Y.</td>
<td></td>
</tr>
<tr>
<td>Transit &amp; Storage Company</td>
<td></td>
</tr>
<tr>
<td>Interstate Natural Gas Co., Inc. (53.96%), Del.</td>
<td>Producing, transporting natural gas</td>
</tr>
<tr>
<td>Interstate Oil Pipe Line Co. (41.90%)</td>
<td></td>
</tr>
<tr>
<td>Yale Oil Pipe Line, Inc.</td>
<td></td>
</tr>
<tr>
<td>McKamee Gas Cleaning Co. (50.01%)</td>
<td></td>
</tr>
<tr>
<td>Mexican Petroleum Co. (99.13%), Calif.</td>
<td></td>
</tr>
<tr>
<td>Plantation Pipe Line Co. (50.4%)</td>
<td></td>
</tr>
<tr>
<td>Standard American Petroleum Corp. (87.62%)</td>
<td></td>
</tr>
<tr>
<td>Standard Catalytic Co. (80%)</td>
<td></td>
</tr>
<tr>
<td>Standard Petroleum Co. (99.8%)</td>
<td></td>
</tr>
<tr>
<td>Sylvestre Oil Co., Inc. (6.18%), N. Y. - Marketing</td>
<td></td>
</tr>
<tr>
<td>Sylvestre Utilities Co., Inc. (28.57%)</td>
<td></td>
</tr>
<tr>
<td>United Petroleum Securities Corp. (67.5%)</td>
<td></td>
</tr>
</tbody>
</table>

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VITA

Born in Philadelphia, Pennsylvania, January 5, 1909, T. Stanton Dietrich was educated in the elementary schools of that city. He attended Dickinson Seminary at Williamsport, Pennsylvania and was graduated in 1931. The next four years were spent in Middletown, Connecticut where he attended and was graduated from Wesleyan University, receiving his Bachelor of Arts degree in June of 1935.

From 1935 to 1939, he was employed by the Connecticut State Department of Public Welfare, from which he resigned in the Fall of 1939 to accept a scholarship in the Graduate School of Public Welfare Administration at Louisiana State University. Upon completion of this one-year accredited curriculum, he transferred to the College of Arts and Sciences and, in June of 1941, he received his Master of Arts degree from the Department of Sociology. He continued his studies toward the doctoral degree in Sociology, but his work was interrupted by service in the U. S. Army from 1942 until late in 1945. Upon his discharge from the Army, he accepted a temporary position as Associate Professor of Sociology at Mississippi State College from January through August of 1946. He then spent the following academic year as Associate Professor of Sociology and Economics at Limestone.
College. During the current school year, 1947-1948, he has returned to Louisiana State University to complete his doctoral dissertation. He also completed his work for the Certificate of Social Work which he received from the Graduate School of Social Welfare in June 1948.

He was married to Sue Eleanor Brown of Baton Rouge, Louisiana, in September 1940, and now has two children: Eleanor, 5 years old, and Fred, 2 years old.

For the Connecticut State Department of Public Welfare he completed two studies on old age assistance beneficiaries: Subsistence Standards and Needs of Male Beneficiaries in New Haven, and The Extent and Causes of Hospitalization Among Old Age Assistance Beneficiaries in New Haven.

Under the direction of Dr. Rudolf Heberle and as a graduate fellow in the Institute of Population Research of the Department of Sociology, he did considerable statistical and research work for several studies on the Louisiana Labor Force, and for other population studies.

As a social-economist, he served as chairman of a joint committee of State and Federal representatives that prepared a study, "Social and Economic Resources of Louisiana", and to which he contributed sections on social conditions, industry, and natural resources. The study was made for, and published by, the Louisiana Educational Survey Commission in June 1942.
He was also employed by the Louisiana State Planning Section of the Department of Public Works to prepare a special report on social and economic conditions that was published in the Biennial Progress Report of the Department of Public Works in June 1942.

The subject of his master's thesis was, "A Comparison of Socio-economic Factors of Students Entering Louisiana State University from Urban and Rural Areas", completed under the supervision of Dr. Edgar A. Schuler, in June 1941. He has also prepared an unpublished study of "Abridged Life Tables for Louisiana, 1930-1940: White Males, White Females, Non-white Males, and Non-white Females".
EXAMINATION AND THESIS REPORT

Candidate: T. Stanton Dietrich

Major Field: Sociology

Title of Thesis: Social Organization Of the Petroleum Industry

Approved:

Rudolf Hechter
Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

Date of Examination:
July 12, 1948