

Oil Rush: Looking for the Land & Petroleum*

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Summary

The American petroleum industry, which came into existence by Edwin L. Drake's discovery in 1859, developed rapidly before the establishment of the Standard Oil's control. At this era, the noisy phenomenon called "Oil Rush" progressed on a large scale in the northwestern Pennsylvania "Oil Region", only where the crude production was performed and the base of petroleum industry was founded. We think the phase of crude production and the Oil Rush in the early days have not been studied enough hitherto in connection with the formative process of modern, capitalist petroleum industry. We will analyze the Oil Rush as a mixture of economic interests, especially including those of landownership. In conclusion, the Oil Rush was a phenomenon that both interests of capital and landownership led many oilmen including "petty industry" to overdrilling, and made crude supply, as their basis of profit, certain. We should pay attention to the fact that, not keeping within the bounds of a receiver of rent, many landowners reacted positively even on the management of oil-well. In this process, some oilmen became millionaire, but many of them were failed by the risk of drilling itself, severe lease terms often forced by landowners, and land speculation.

Keywords: American oil industry, landed interest, landownership, land speculation, 19th century, oil producer, Oil Region, Pennsylvania, petroleum development, Standard Oil Company

I. Introduction: A Review of Past Researches and a Suggestion of New Viewpoints

The origin of American petroleum industry can be found in the memorable completion of the first oil well (drilled by mechanical mode) in August 27, 1859 by Edwin L. Drake, who was a general agent of the Seneca Oil Company. Therefore, the petroleum industry was borne 20 years earlier than the establishment of grand combination by the Standard Oil Company. This epoch-making event occurred in the suburbs of Titusville, a small town

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* Prefatory Note: The author is deeply appreciative of the judge of this article who gladly undertook the laborious task and gave several suggestive comments.

I would like to dedicate this article to Prof. Kazuo Matsubara and Prof. Takeshi Kamijima in honor of their retirement. The lecture of Prof. Matsubara in my graduate school days forms one of my unforgettable memories. Because I was only one student attending the lecture of 1996, I could get a lot of knowledge through fruitful "one to one" discussions. I heartily wish both Professors every happiness, good health and even greater success in the academic world.

Map 1: The Appalachian Oil Field



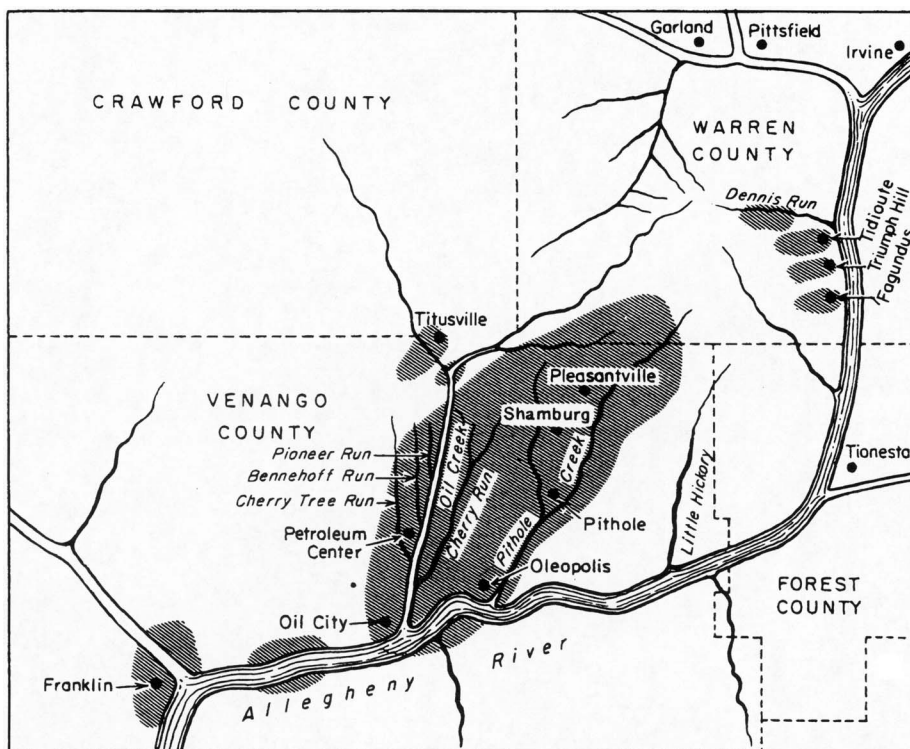
Source: Anthony Sampson, *The Seven Sisters: the Great Oil Companies and the World They Made*, London, 1975, p. 19.

in northwestern Pennsylvania, and then, the petroleum development progressed so rapidly. The shadowed part in Map 1 roughly indicates the Appalachian oil field where almost all petroleum was produced during the 1860's and 1870's. Although the importance of the Appalachian field diminished relatively in the latter part of 1880's, this region remained the status as one of the main oil fields during the 19th century.¹⁾ Map 2, enlargement of a square part described on Map 1, shows the only oil field throughout the 1860's, that is to say, the Oil Region.

Soon after the success of Drake Well, "Oil Rush", a maniac rush to the Oil Region searching for oil, broke out. The scene, comparable to the Gold Rush in California, emerged in the Oil Region of Pennsylvania. In particular, among the Oil Region, the Oil Rush concentrated on the Oil Creek valley in the 1860's (See Map 2). As the petroleum development progressed more intensively, jumbled derricks, mushroomed boom towns and so on became to form important factors of landscape in this region. The lonesome region -the main business activity was a small forestry hitherto, bringing down timber from

1) As widely known, Russian (Baku) oil appeared as a rival of American from the 1880's, and surpassed American output in 1897. In the country, the Lima-Indiana oil field rapidly expanded its output from the 1880's as well. See Harold F. Williamson & Arnold R. Daum, *The American Petroleum Industry*, vol. 1, *The Age of Illumination 1859-1899*, Evanston, 1959, chap. 7. The Appalachian oil field mainly consisted of the three Oil Regions; Oil Creek district (developed from the 1860's~), Butler, Clarion and Armstrong district (1870's~), Bradford district (1877~). In this paper, "the Oil Region" is defined as the Oil Creek district.

Map 2: The Oil Region, 1860's



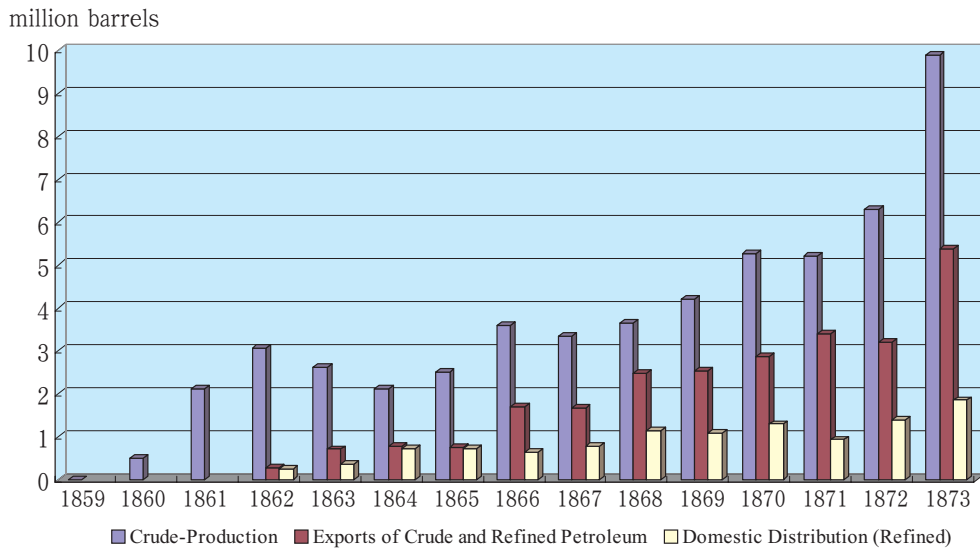
Source: Williamson & Daum, *The American Petroleum Industry, The Age of Illumination 1859-1899*, Evanston, 1959, p. 129. Shaded parts show oil lands.

hills and shipping it to Pittsburgh through the Allegheny River or processing timber in sawmill in Oil Region and shipping it to markets- was compelled to change the structure of economy so drastically.²⁾

Keeping pace with expanding Oil Rush, the output of crude increased quickly. As we can see in Chart 1, the output of crude per year increased from 2,000 barrels in 1859 to 4,000,000 barrels in 1869, ten years later. In addition, this trend became more clear after 1869; the output reached about 10,000,000 barrels in 1873. To explain this increasing trend, there is one important factor, that is, the rapid expansion of foreign petroleum markets. In 1866 the exports of petroleum greatly surpassed the quantity of petroleum products distributed in the U. S. In fact, the amount of petroleum exported from the U. S. rose to about \$16,000,000 as early as 1865 (it ranked sixth in all exports), then astonishingly in 1869 to \$30,000,000 (ranked second).³⁾ The low price of petroleum in the U. S., and the

2) By U. S. Census, we can get general information about the industrial structure in pre-Drake period. U. S. Census Office, *The 7th Census of the United States, 1853; Manufactures of the United States in 1860, 1865*, p. 531.

Chart 1: Annual Output of Crude, Exports of Crude and Refined Petroleum, and Domestic Distribution (Refined)



Source: Williamson & Daum, *The Age of Illumination 1859-1899*, pp. 737-738. Appendix A.

big demand for petroleum in Europe acted together as a background of the expansion of the foreign market. In Europe, especially in Britain who had experienced the Industrial Revolution very early and developed an urbanization soon, the lack of oil (lard, whale oil, etc.) became so serious and the price of oil grew so much that newly introduced petroleum products were demanded urgently. It is safe to say almost all uses of petroleum was for illuminating and lubricating purposes in those days. On the other hand, the expansion of petroleum market could not be realized until the development of refining sector and transporting sector (downstream sector) advanced in accordance with an increasing crude output. After all, it was the basic precondition of the oil boom that the lonesome area in northwestern Pennsylvania was suddenly connected directly with the eastern market and the European market beyond the Atlantic Ocean.

This paper focuses on the early days of the petroleum industry in the exciting era of the Oil Rush as I have described above roughly.

At first, we will survey the past researches about the history of American petroleum industry. It can be classified into 3 types:

- (1) The research focusing on the business history of the Standard Oil Company
 - (2) The research focusing on the early petroleum industry
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- 3) The petroleum exports in 1865 were exceeded only by gold, corn, tobacco leaf, wheat and wheat flour. About the exports of 1865, see Paul H. Giddens, *The Birth of the Oil Industry*, New York, 1938, pp. 99-100. About the exports of 1869, see *ibid.*, p. 193. The proportion of exported oil products (mainly kerosene) to crude is not clear in both data.

(3) General history of the petroleum industry discussing as far as the present age

In the first type, we can find the famous researches made by Ida M. Tarbell, Allan Nevins, Ralph W. Hidy & Muriel E. Hidy.⁴⁾ All of them examine the way to the formation of Standard Oil's monopoly system and its development thereafter in detail. Among of them, Tarbell's research, we can say, is a testimony of a contemporary, and it influenced the academic world very much. Because she criticized thoroughly the Standard Oil's unfair management strategy, then unknown among the public, by using many reports of trust investigation by Congress and law suit records, etc. Moreover, her view was not narrow. Because she examined not only the one big business, Standard Oil, but also many small oil producers who fell victim to the monopoly. In a word, she insisted that there were many independents and small oilmen who were exploited by the unfair strategy of Standard Oil behind the rapid development of the American petroleum industry.

However, Tarbell seems to grasp both the formative process of the American petroleum industry and that of Standard's monopoly system as almost the same process. Although it goes without saying that Tarbell's supreme meritorious deed is revealing the hidden victims under the strong control of Standard Oil, in addition to this, we should place the hidden victims in the center of analysis; in other words, we should bring the hidden victims in the "shady-side" into the "sunny-side" of the early petroleum industry. Because the main actors on that stage were the hidden victims themselves. In short, even when we deal with the establishment of Standard Oil's monopoly, we have to understand Standard Oil, a big business in the refining sector, among the whole structure of petroleum industry including many oil producers. Then and only then, we will be able to properly grasp control system of Standard Oil.

As representative of the second type, we can show the research made by Paul H. Giddens,⁵⁾ which focuses both on northwestern Pennsylvania, the Oil Region, as early as the 1860's and on the oilmen who rushed there during that era. Through Giddens's graphic descriptions, we can understand the situation of the up-stream, the crude producing sector, and the condition of the crude producing area in detail. Together with a collection of materials edited by him,⁶⁾ Giddens's research in itself contains so many important materials about the early petroleum exploitation that this paper partly depends on his works. However, the critical mind such as Tarbell's is not evident here. He only enumerated transitions of the situation of the Oil Region as it was without saying anything about relationships with other interests of the petroleum industry. The reason why he had such a style of description is clear; for Giddens, the petroleum industry, as one of the most in-

4) Ida M. Tarbell, *The History of the Standard Oil Company*, 2vols., New York, 1904; Allan Nevins, *Study in Power: J. D. Rockefeller, Industrialist and Philanthropist*, 2vols., New York, 1953; Ralph W. Hidy & Muriel E. Hidy, *History of the Standard Oil Company (New Jersey): Pioneering in Big Business 1882-1911*, New York, 1955.

5) Giddens, *op.cit.*

6) Giddens (ed.), *Pennsylvania Petroleum 1750-1872: A Documentary History*, Titusville, 1947.

fluent industries for humankind, was born and grew up in the U. S. and its expansion and contribution should continue forever, that is, all formative processes promised a rosy future.⁷⁾ As a result, Giddens's images of the early petroleum industry have no critical mind and theoretical framework as were seen in Tarbell's, he just enumerated many facts from the beginning to the end, and ignored the scattered mixture of economic interests. All he could do was to insist vaguely that the early petroleum industry made the U. S. rich in conclusion. However, since many important facts are given in his works, it is also possible to say that he left the first class materials for researchers at the next generation.

As the representative research belonging to the third type, we have the work done by Harold F. Williamson & Arnold R. Daum and Daniel Yergin.⁸⁾ Although Williamson & Daum's research assumes the taste of chronological history, their work proves to be the most detailed in some points among all the research I have already mentioned above; First, they clarified the technical aspect of every sector in the petroleum industry. Second, through using plentiful materials including important statistics, they demonstrated the dynamics of every sector in the petroleum industry. They produced a remarkable achievement in clarifying the developments of all sectors in detail which had been hitherto studied separately. In this point, they were pioneers and even now there is no parallel. But regrettably, it is doubtful whether they could sufficiently describe "over-all, integrated, and objective account of the evolution of the American petroleum industry",⁹⁾ as they purposed. That is to say, it is thought that they could not take an objective approach to the integrated image of petroleum industry by elucidating the complication of economic interests in all sectors, especially, taking the interest of landowners into consideration in the case of crude producing sector.

Yergin's research is the newest among all I have mentioned above. He described the historical offense and defense of the rulers of petroleum up to the Gulf War in a very interesting way. Although nearly the same as Williamson & Daum in terms of chronological history, his research assumed more abstract tastes as to the early days of oil.

In the next phase, we take a glance at some researches constructed in Japan. We use three categories here as well.

Concerning the first type, many researches have been accumulated in the field of economic history and business history as in the U. S. There are two typical researches, the first one pursues the formative process of the Standard Oil Trust to analyze monopoly capital and the other takes notice of Standard Oil to analyze financial capital. The representative research of the former was made by Akitake Taniguchi and the latter by Takashi Mori.¹⁰⁾ Although both had a epoch making importance in reviewing the position of Stand-

7) Giddens, *The American Petroleum Industry: Its Beginnings in Pennsylvania!*, New York, 1959, p. 7.

8) Williamson & Daum, *op.cit.*; Harold F. Williamson, Ralph L. Andreato, Arnold R. Daum & Gilbert C. Klose, *The American Petroleum Industry*, vol. 2, *The Age of Energy 1899-1959*, Evanston, 1963; Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power*, New York, 1990.

9) Williamson & Daum, *op.cit.*, p.ix.

ard Oil (research of which had been hardly enough in Japan) with its managerial characteristics, in the history of monopoly capital and financial capital, their purpose of analysis was not in dealing with the formative history of petroleum industry itself.

There is no research falling completely under the second type in Japan, but Katsutoshi Murakami, following nearly in the same approach as Giddens, went into detail about the industry of the 1860's in his book which comprehensively traced the development of the industry through the 19th century.¹¹⁾ And moreover, inquiring into the relationship between railroads and oil industry by analyzing the South Improvement Company case, Jiro Ozawa examined early petroleum industry partially depending on Giddens.¹²⁾

The research made by Kotaro Seki can be taken up as a third type.¹³⁾ He chronologically explored the mechanism of price determination of petroleum and the rulers of petroleum who made effort to control it from a unique viewpoint. However, he merely referred to the early days of oil on a few points.

Generally, looking back at the researches above that has been made until today, it is safe to say that there has been no research involved with the early petroleum industry as a whole better than Williamson & Daum's yet, even though there has been some researches in the specific field (as the research of Taniguchi and Mori). For example, even in Yergin's *The Prize* (1990), the researches of Williamson & Daum and Giddens were used as basic sources. Our theme is to reconstitute the whole structure of the petroleum industry in the cradle, using the facts, as the starting point of research, clarified by Giddens and Williamson & Daum, and in addition, using records and testimonies left by many contemporaries that lived in the latter part of 19th century; Thomas A. Gale, William Wright, S. J. M. Eaton, Andrew Cone & Walter R. Johns, J. T. Henry, J. J. McLaurin (Tarbell might be included).¹⁴⁾ Our basic viewpoints for that theme are as follows.

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- 10) Akitake Taniguchi, "Early Petroleum Refining Industry and Standard Oil, 1870-1882" *The Economic Review* (Kyoto University), vol. 117, no. 4, 1976; Taniguchi, "The Establishment of Standard Oil Trust" *TOCHISEIDOSHIGAKU (The Journal of Political Economy and Economic History)*, vol. 75, 1977; Taniguchi, *Study in the Early American Trust*, Osaka, 1983; Takashi Mori, "A Note on the Oil Industry in the Period of the American Combination Movement" *The Economic Studies* (Hokkaido University), vol. 17, no. 2, 1967; Mori, *An Inquiry into the History of American Capitalism*, Kyoto, 1976, chap. 5.
 - 11) Katsutoshi Murakami, *Pioneers in Petroleum*, Tokyo, 1996.
 - 12) Jiro Ozawa, "On the Relation between the early Petroleum Industry and the Railroads" *The Journal of Gifu College of Economics*, vol. 3, no. 2-3, 1970; Ozawa, *The Development of American Railroad*, Kyoto, 1992, chap. 5. Unfortunately, a lot of errors about cited data are seen in this paper. As to the conspiracy of the South Improvement Company, see Tarbell, *op.cit.*, vol. 1, chap. 3; Williamson & Daum, *op.cit.*, pp. 346-352.
 - 13) Kotaro Seki, *The Conquerors of Petroleum*, Tokyo, 1988.
 - 14) Thomas A. Gale, *The Wonder of the Nineteenth Century!/: Rock Oil in Pennsylvania and Elsewhere*, Erie, 1860; William Wright, *The Oil Regions of Pennsylvania. Showing Where Petroleum is Found; How it is Obtained, and at What Cost. With Hints for Whom it May Concern.*, New York, 1865; S. J. M. Eaton, *Petroleum: A History of the Oil Region of Venango County, Pennsylvania. Its Resources*,

First, we have to give a clear definition to the formation of the American petroleum industry. In Tarbell's research, the formation of the American petroleum industry was virtually identified with the formation of the monopoly by Standard Oil. And in Japanese researches, which might be evaluated as original works, the focus was on the formation of the Standard Oil Trust or financial capital. Indeed, the Standard Oil Trust (1882) was organized in a short time after the discovery of the Drake Well. However, is it really possible to consider the formation of the petroleum industry and the formation of a monopoly, on the same level of logic, as an identical phenomenon?

Drake's success in drilling the first crude oil well aiming for a market, especially the European market, opened the way for the creation of the petroleum industry through capital as I clarified in another paper.¹⁵⁾ But because many small crude-producers, which might include the "petty industry", were dominant especially in the crude-producing sector, the capital could not take command of whole production process of petroleum, that is, crude-production, transportation to refinery, refinement, and transportation to market, until some stages were passed. We consider the way to the conquest of whole production process through capital to be the formative process of the petroleum industry, and distinguish logically that process from the formation of a monopoly. This is the first basic viewpoint. And actually, I attach great importance to the establishment of indirect control over the crude-producing sector by some railroad companies, which controlled the transporting sector before the formation of Standard Oil Trust, that is, before the introduction of a long-distance pipeline, although we have to exclude this theme from the subject of analysis in this paper.¹⁶⁾

Mode of Development, and Value: Embracing A Discussion of Ancient Oil Operations; with a Map, and Illustrations of Oil Scenes and Boring Implements, Philadelphia, 1866; Andrew Cone & Walter R. Johns, *Petrolia: A Brief History of the Pennsylvania Petroleum Region, Its Development, Growth, Resources, etc., From 1859 to 1869*, New York, 1870; J. T. Henry, *The Early and Later History of Petroleum with Authentic Facts in Regard to Its Development in Western Pennsylvania*, Philadelphia, 1873; J. J. McLaurin, *Sketches in Crude Oil: Some Accidents and Incidents of the Petroleum Development in All Parts of the Globe with Portraits and Illustrations*, Harrisburg, 1896 (1st.ed.).

- 15) See Taro Toyoda, "The Way to the Formation of the American Petroleum Industry —The Discovery of the Drake Well—" *The Economic Review of the Faculty of the Graduate Course* (Kansai University), vol. 32, no. 1, 1998; The concept of the "capital" used in this paper implies "a social relationship between capital and wage labor, functioning on the general basis of production of commodities; in other words, the capital relationship" and essentially, "the despotic command and the forced authority over labor, especially surplus labor." Yoshiharu Ozaki, *Economics and Historical Revolution*, Tokyo, 1990, pp. 15-17. Analyzing the crude-producing sector, a fortress of petty industry in petroleum industry, constitutes a main purpose of this paper, however as a matter of fact, some big producers already assumed capitalist management. To show this mixed situation, I use the term "small capital."
- 16) As to the Railroad's establishment of command over the whole process of production of the petroleum industry, see Taro Toyoda, "The Structure of the Early Petroleum Industry in the United States" *The Economic Review of the Faculty of the Graduate Course* (Kansai University), vol. 34, no.

Secondly, we reconstitute the formative history of the petroleum industry from the viewpoint of crude-producers. They were uncovered only as the hidden victims of Standard Oil's monopoly system in Tarbell's research. And Japanese researchers have given little important meanings to them. We analyze the labor force and small money of crude-producers, bringing them not to "shady, passive-side" but to "sunny, positive-side", who rushed into northwestern Pennsylvania in the formative years of petroleum industry. That is to say, we make an analysis of the early petroleum industry by placing the overwhelming majority; small oilmen, who were tossed and turned by intense ups and downs among a complication and opposition of economic interests, in the center of the argument. Even the grand vertical integration of Standard Oil, which was organized with lightning speed, did not reach its tentacle to the crude-producing sector at least until 1889, this sector had remained to assume the mode of production adopted in 1860's for about 30 years thereafter. Therefore, if we consider the capital's conquest over the whole production process of the petroleum industry, necessarily an analysis about the crude-producing sector in 1860's should be demanded.

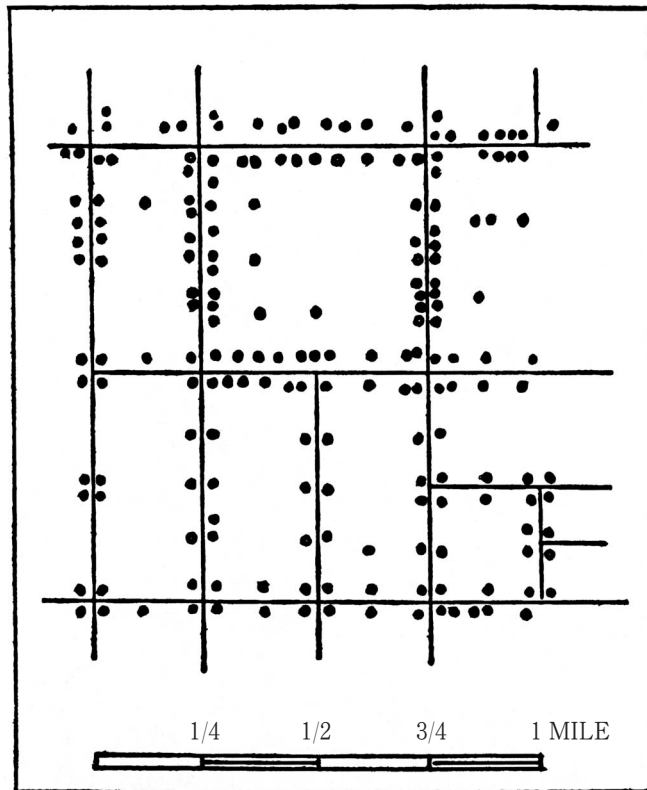
Naturally the landed interest is related so closely to the crude-producing sector, because the conditions of both oil reservoir and location are decisively important. Oilmen had an earnest desire to get a hopeful land, under which rich oil might be located, in the midst of Oil Rush, and on the other hand, the landed interests accelerated the rush more and more, organizing many oilmen into their base of exploitation through various measures. In short, it is necessary to analyze the complications of economic interests including landed interests. This is the third basic viewpoint. Surely Williamson & Daum analyzed the structure and productivity of crude-producing sector, but they did not explore enough the action of landed interest, one of the significant interests relating to that sector. Since our theme is to reconstitute the whole structure of early petroleum industry from the viewpoint of crude-producers, first of all we have to make a correct image of crude-producing sector from all perspectives, including the landed interest. In addition, if the action of landed interest in the midst of Oil Rush was one form of response from the landed interest in the development of American capitalism, it might throw some doubt on the general view of "an ideal development of capitalism", based on small producers, in the U. S., although this point is beyond our coverage of analysis.

By the way, the crude-producing business is classified as an extractive industry; and therefore "primarily, subject of labor rules production, constitutes the base of production".¹⁷⁾ However, different from the fishing industry and so forth, the subject of labor does not reproduce itself year by year in the crude-producing sector, and as a result, exhaustion is unavoidable. Also, the crude-producing sector has a different nature from the coal mining industry, in which a mining lot (an area of land) plays a critically important role as a

2, 2001.

17) Mikio Sumiya, *An Analysis on Japanese Coal Mining Industry*, Tokyo, 1968, p. 373.

Figure 1: Offset Wells



This map is based on the U. S. Geological Survey, 1917, and showing relation of oil wells to property lines in the Cushing, Oklahoma, Oil Field. Note the small holdings, the great number of wells and the tendency for wells to occur in pairs on opposite sides of property lines.

Source: George Ward Stocking, *The Oil Industry and the Competitive System*, Boston, 1925, p. 171.

restrictive factor of production. Because petroleum, a liquid matter, covered an extensive underground area taking the form of an oil reservoir, it can be pumped without restriction forced by the area of private property on the surface of the earth. And an oilmen's attempt in trying to get petroleum from the oil reservoir under the other's property resulted naturally in drilling numerous "offset wells" along the boundaries of private property (See Figure 1). Therefore the more land is subdivided, the more competition for oil production is intensified. For the above-mentioned reasons, in the oil-producing sector, naturally an intensive competition for oil production happens inevitably, unless some regulation is adopted. The petroleum industry involves a plunder of the earth as its natural character.¹⁸⁾ This is the fourth basic viewpoint.

This paper throws light upon Oil Rush in the early days of petroleum industry standing

on the basic viewpoints mentioned above. How did the production of petroleum, which may constitute the foundation of the petroleum industry, develop in those days when the modern, capitalist petroleum industry was in formative process? This process can not be clarified until we grasp comprehensively and structurally the complication of economic interests, especially landed interests, premising the crude-producer's positive *raison d'être* unlike Tarbell's research. In addition, this approach should be the key to elucidate the control system of Standard Oil.

II. Seeking for Petroleum

As I have mentioned above, many oil seekers rushed to the Oil Region in northwestern Pennsylvania in the 1860's. The simplest but most important reason why those men began over-drilling¹⁹⁾ desperately was the dream of making a fortune at one stroke; that is, petroleum was a commodity which could make them a millionaire in one night. It is obvious that neither the gold rush nor the oil rush could happen if there had been no possibility of making a fortune at one stroke. Then, we examine concrete conditions of the Oil Rush.

The Drake Method of Mechanical Drilling and the Spring-Pole Drilling Method: A Condition of Crude-Production by Small Capital

The memorable completion of the Drake Well in 1859 was an event of great significances.²⁰⁾ As commonly known, he succeeded to drill an oil well and pump crude oil for the first time in history, that is, by his success the oil industry was given birth. This is the first significance. Simultaneously, the success of the Drake Well means a success of mechanical drilling too, therefore, it paved the way for mass-production of crude oil even from the early days. This is the second significance.

Basically the Drake Well had such a technical structure as follows (See Figure 2). It consisted of three parts generally; a steam engine, a transmission, and a working device, and its mode of drilling is known as the "cable-tool method" at present.²¹⁾ Both a steam

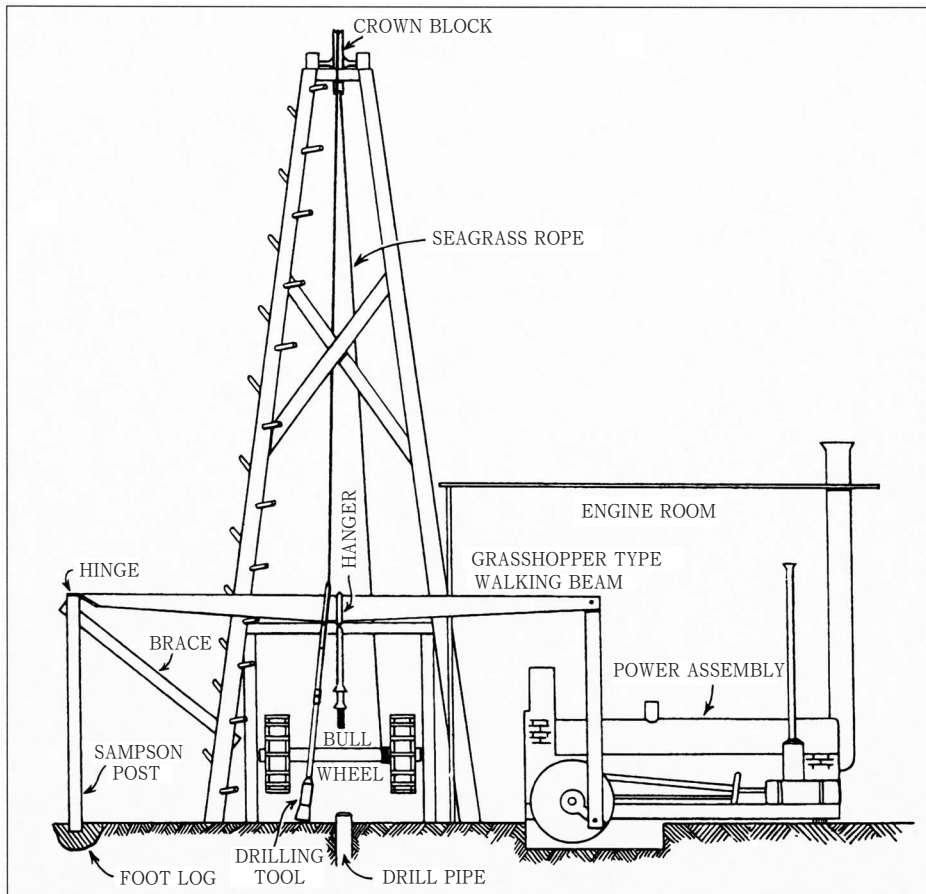
18) As to the concept of "the earth", see Ozaki, *op.cit.*, pp. 184-219, 252-254 and Kunitane Umegaki, *Capitalism and Human-the Earth*, Tokyo, 1991; We should be borne in mind the function of "rule of capture" which authorizes to get "your neighbor's oil before he gets yours" as a cause of competitive practice in production. See Samuel B. Pettengill, *Hot Oil: The Problem of Petroleum*, New York, 1936, chap. 9.

19) The term of "over-drilling" means a competitive drilling practice which considerably lowers the subterranean gas pressure. This practice will maximize the initial production, but recoverable amount of crude as a whole will decline because well will no more flow without help of gas.

20) About the way to the success of Edwin L. Drake, and its significance, See Toyoda, "The Way to the Formation of the American Petroleum Industry"; Giddens, *The Birth of the Oil Industry*, chap. 3; Harvard Business School (ed.), *Oil's First Century*, Cambridge, 1960, pp. 21-25.

21) Nippon Oil Company, Limited, *The Centennial History of the Nippon Oil Company, Limited*, Tokyo,

Figure 2: Drake Well Rigging and Power Hookup



Source: Williamson & Daum, *The Age of Illumination 1859-1899*, p. 138.

boiler and a steam engine (of 5 horsepower) were installed in an engine room, built by the side of a derrick, to apply steam power as motive energy of the rig. The rotary motion generated by flywheel was changed to the parallel, up and down motion through cam, pitman, and walking beam (grasshopper type) and then, cable and tool string, suspended from the middle of walking beam, was given the up and down motion as drilling power. The percussion to the bed rock caused by this up and down movement made drilling possible. When the sediment, or battered rock accumulated in the well, it was removed by means of the "sand pump", or bailer. In case of the replacement of drilling tools, the "bull wheel" was used to raise or lower the tool string. When the drilling bit struck the

oil reservoir and pumping work was necessary, then the crude oil was pumped by the same steam power as in drilling, and transported to a storage tank.²²⁾

Originally the process of labor which was involved in the exploitation of petroleum was such a primitive one: it did not mean a drilling process to a oil reservoir using a rig, instead it meant a digging a big hole and dipping oozed crude by hand. But this primitive process of labor was converted to the mechanical drilling system of the Drake Well, including motor, transmission and working machine, which, accompanied by some improvements, made a great contribution as a model of mechanical drilling until the end of 19th century when rotary drilling was introduced extensively. In this context, what we should be borne in mind is the fact that wells modeled after the Drake Well became widespread among many small crude-producers who might be called the “petty industry”. The first reason and condition of this point is that the operation of these wells could be done by 2-4 workers, according to Thomas A. Gale’s *The Wonder of the Nineteenth Century!*, “the first book written about petroleum” and William Wright’s *The Oil Regions of Pennsylvania*.²³⁾ As the second, judging from the cost of Drake Well, about \$2,000, it is suggested that generally the cost needed in preparation for drilling was relatively low.²⁴⁾ As a primary factor for low cost, there was such a good fortune, a privilege only in the beginning days, as the Drake Well struck oil at a depth of 69 feet from the surface.

But this good fortune came to be restricted to a small part of oilmen as the Oil Rush developed further. As soon as the Rush started, the flats along both banks of Oil Creek were leased up with lightning speed. Because that area held oil reservoirs in relatively shallow depth and had a good “surface indication” appeared naturally, the resident could empirically know the high possibility of a strike. Therefore the late comer came to be forced to seek the mining lot in less-promising, hilly areas where the petroleum indication had never appeared. Then, as it became impossible to strike oil easily, oilmen were pressed to extend drilling depth to succeed in this situation.

Then, it is a question whether an extension of drilling depth was accompanied by an increase of costs which might prevent small capital from entering crude production, or not? Table 1 shows the drilling costs in different producing-areas. Although wells seldom exceeded 200 feet in depth prior to 1862, depth up to 600 feet became common by 1865. Then 700-900 feet was dominant in 1868, 1,000 feet in 1871, 2,000 feet in 1880, respectively. In this point, we should pay attention to the fact that the drilling costs did not rise in proportion to the extension of drilling depth which increased as much as 10 times for 18 years. That is to say, the drilling costs per foot were gradually lowered: a noted example of this is that the drilling depth in Bradford area reached as deep as 2,000 feet in 1880, while the drilling cost was only \$2,632; \$1.3 per foot. However, as is widely known, the

22) Cone & Johns, *op.cit.*, chap.VIII, IX; Gale, *op.cit.*, chap. 4.

23) Gale, *ibid.*, p. 25; Wright, *op.cit.*, p. 70. Thomas A. Gale was a resident on the Oil Creek. William Wright was a correspondent of New York Times.

24) Giddens (ed.), *Pennsylvania Petroleum 1750-1872*, pp. 148-153.

Table 1: Estimated Total Drilling Cost of Individual Wells in Different Pennsylvania Oil Regions, 1865-89

Year	Area	Drilling depth/ft	Total cost*	Cost/ft
1865	Pithole	650	\$7,600	\$11.69
1865	Venango County	600	4,650	7.75
1868-69	Tallman Farm	860	4,800	5.58
1871	Parker's Landing	1050	5,200	4.95
1876-77	Bradford	1600-2000	4,000	2.00-2.50
1880	Bradford	2000	2,632	1.31
1889	Washington County	2400	5,940	2.47

* Total cost includes: derrick, boiler and engine, casing, tubing, belting, sucker rods, etc., driller's costs (contract drilling price), tank, and in some cases torpedoes.

Sources: Williamson & Daum, *The Age of Illumination 1859-1899*. p. 769; Derrick Publishing Co, *Derrick's Hand-Book of Petroleum: A Complete Chronological and Statistical Review of Petroleum Developments from 1859 to 1898*, vol. 1, Oil City, 1898, p. 52.

price-level trend through the 1860's was a very complicated one. According to the Warren & Pearson wholesale price index, it was doubled during the Civil War period (1861: 89, 1865: 185, 1910-1914: 100). But after that, this hyper-inflation settled down quickly, and the price level returned to that of 1861 in 1879 (1879: 90), and then continued to fall gradually. The period shown in Table 1 was affected by this deflation phase to some extent, but the drilling costs per foot were lowered beyond the deflation level nevertheless. In short, "when viewed against the broader background of generally falling prices, the gradual decline in drilling costs will appear much less impressive",²⁵⁾ but the improvement of efficiency in drilling apparatus must be kept in mind as a preventive factor of a rise in drilling costs. Besides, in view of the increase in the average life expectancy of producing wells (prior to 1862: a few months, 1865-1866: 12-18 months, 1871: 32 months) and the decrease in the percentage of dry holes (one out of twenty wells drilled came to be a producing well prior to 1862, one out of five in 1865-1866, five out of eight in 1868, 1871), it is clear that the drilling costs were decreased relatively. Apparently technical improvements in steam engine, well completion and drilling tools made a great contribution, but this paper does not refer to them in detail.²⁶⁾

25) Williamson & Daum, *op.cit.*, pp. 767.

26) About various data in relation to drilling, see Cone & Johns, *op.cit.*, p. 123; Williamson & Daum, *ibid.*, pp. 156-163. About the general trend of prices, see G. F. Warren & F. A. Pearson, *Prices*, New York, 1933, pp. 11-13, pp. 196-197; U. S. D. C., Bureau of the Census, *Statistical Abstract of the United States*, 1899, p. 92; *ibid.*, 1921, p. 854. As to the technical development of drilling rig, see

Figure 3: Spring-Pole Drilling Method



Source: J. J. McLaurin, *Sketches in Crude Oil*, Harrisburg, 1896, p. 70.

So far I have referred to the costs of mechanical drilling involving steam power, but if we would look into the situation more closely, we could realize that there was an alternative to mechanical mode, that is, spring-pole drilling method (See Figure 3). “An elastic pole of ash or hickory, twelve to twenty feet long, was fastened at one end to work over a fulcrum. To the other end stirrups were attached, or a tilting platform was secured by which two or three men produced a jerking motion that drew down the pole, its elasticity pulling it back with sufficient force, when the men slackened their hold, to raise the tools, fixed by a rope to the spring-pole two or three feet from the workmen, a few inches”.²⁷⁾

Williamson & Daum, *op.cit.*, chap. 7; Cone & Johns, *ibid.*, chap. VIII. Of the data shown in Table 1, the data of 1868 are in Cone & Johns, *ibid.*, p. 463. The details of the sum total, \$4,800, are as follow:

Engine, new, set up	\$1,150
Drilling-rig, complete	550
Driving-pipe, belting, &c.	200
Drilling-contract price	2,000
Tubing, casing, sucker-rods, &c.	900
Total	4,800

*Average time required to drill a well: 40 days

Laborious repeats of this motion made it possible for a bit, attached to the lower end of tool strings, to drill bed rock gradually. This drilling method depended on man power, and was very economical and effective method in drilling the first 100 feet. In fact, it was widely used for a few years following Drake's success, and even in 1865, it was still used.²⁸⁾ In 1860 Gale suggested that the spring-pole drilling method was used very commonly, and by using it, drilling as deep as 36 feet per 6 days could be observed as an outstanding example.²⁹⁾ Actually, the drilling speed of the Drake Well was only 3 feet per day. Although the spring-pole method was inadequate for deep drilling, it was possible to excavate up to 400-500 feet.³⁰⁾

With the above, we have mentioned about two typical drilling methods. It took indeed some funds to execute mechanical drilling, but they were not a prohibitive sum. Therefore, oil men could cope with the monetary problem by organizing of partnership, and the necessary cost itself was constant in spite of the sharp extension of drilling depth. Moreover, especially in the early years, there was an alternative such as spring-pole method, which gave an opportunity of entry to crude-production to oilmen who did not have enough money to prepare mechanical drilling, just as Rev. S. J. M. Eaton of Franklin referred.³¹⁾ It seems that the majority of people who came to the Oil Region were men of limited means. Some oilmen took such rational means as drilling the first 100 feet by spring-pole method, and then by mechanical drilling.³²⁾ They intended to maximize profit by combining two drilling methods cleverly. Though it is difficult to estimate the costs of spring-pole drilling for lack of necessary materials, taking the cost of steam engine, fuel and maintenance into consideration, it should be extremely low. The number of labor men who were needed for both in drilling and pumping was quite a low: in fact, both works could be done by 2-4 labor men in the spring-pole method, and even in mechanical drilling. And the spring-pole method was not the only other alternative to mechanical drilling. According to Eaton, hose power, and even water power, taking advantage of the location of well, could be applied to drilling and pumping works.³³⁾ Considering these factors, the costs should be lower.

Incidentally, the early years of petroleum industry was a period of "sturm und drang" literally. As prosperity and depression repeated so furiously, many oilmen were kicked out of the business, and in the same time, it made many new comers easy to enter into the business. Andrew Cone & Walter R. Johns, the journalists of the Oil Region, mentioned about the situation in hard times as follow.

27) McLaurin, *op.cit.*, p. 70.

28) Eaton, *op.cit.*, pp. 106-109; Henry, *op.cit.*, pp. 95-96, pp. 248-249.

29) Gale, *op.cit.*, pp. 25-28.

30) Henry, *op.cit.*, p. 96.

31) Eaton, *op.cit.*, p. 109.

32) Henry, *op.cit.*, pp. 380-388.

33) Eaton, *op.cit.*, pp. 107-108.

The year 1867 was one of general depression and low prices. Thousands of acres of the lands of defunct oil companies, and scores of engines, as well as a vast amount of machinery, were sold by the sheriff of Venango County for debt and taxes. A general thinning out of superintendents, operators, and business men, from all the principal localities took place...

The sacrifices made in the sale of property by the sheriff during 1867, and the Winter of 1868, was very great. Engines, the first cost of which was from \$2,500 to \$3,000, sold as low as twenty-five and fifty dollars each. Other machinery and even the lands, were sold at similar rates, in proportion to their first cost.³⁴⁾

In short, this is the depiction in which the sharp decline in crude oil price, caused by over-production, forced many oilmen to go bankrupt, and then, the sheriff disposed of their property by right of "sheriff's sale" or "judicial sale". Although some doubts remain about the extremely low selling prices of property, considering the fact that secondhand mechanical goods were used widely over the Oil Region, the execution sale at low prices can be understood to some extent. Generally speaking, in hard times, the high availability of means of production at low prices should weaken the barriers to enter into the crude-producing sector. Surely the crude price itself became lower during the depression period, but stimulation to the entry was not always decreased. If some oilman had struck a flowing well or gusher, he could have covered a loss as a result of low prices, and might have made more profits in addition.

Because of the backgrounds above mentioned, scores of oilmen were able to enter into the crude-producing sector by investing a small sum of money, and actually some of them made a fortune. In the next, we look over some cases of successful oilmen.

The Advent of an "Oil Upstart"

As the important cases of an oil upstart in the Oil Region, we take up both J. W. Sherman and Orange Noble.

J. W. Sherman came from Cleveland to Titusville on foot in the summer of 1861 with his life saving of about \$200 in his pocket. And he also could command a small amount of money belonging to his wife. He obtained a lease on the Foster farm, and commenced to put down a well by using spring pole power because of embarrassments encountered in getting ready to drill. In the "first sand" (about 140 feet deep) he had a "good show" of oil, but long before he reached the "second sand rock," (about 294 feet deep) his own money and wife's funds gave out, and he was compelled to shut down the operation. The spring pole which depended on man power had become powerless to work the drill effectively, and horse or steam power was indispensable. After many days of considering, an in-

34) Cone & Johns, *op.cit.*, pp. 85-86.

terest in the well was disposed of “for an old horse,” and he proceeded the work by using the horse. But after a while the work became too onerous for the poor horse, and another one-sixteenth interest was sold to two men who owned a small steam engine and the work was again resumed by using this steam power. But coal as fuel for steam power was an expensive item, and it could not be bought without the ready cash, and none of the partners could raise money enough to buy a single ton, and the work was suspended again. A sixteenth interest was now offered for sale in order to purchase fuel, when, after waiting for a time, it was disposed of for \$80 and an old shot gun. In March, 1862, just before the last dollar of this money had been expended, the drill penetrated a crevice, and the Sherman Well began to flow at the rate of 1,000 barrels per day. Although, after a while, this well decreased to 700 barrels, and at the end of two years became a pumping well, it produced a tremendous total crude-output in the early days. The total receipt for oil sold was estimated at \$1,700,000, of which Sherman acquired about \$1,000,000, and became exactly an oil upstart.³⁵⁾ Wright wrote: “Mr. Sherman was originally a poor, but very energetic man. He is still energetic, but not poor. Had to borrow means enough to finish the drilling; is now one of the magnates of that country.”³⁶⁾

In the next place, we take up a case of Orange Noble. He was born in 1817 as the eldest son of a peasant proprietor in Washington County, New York. After he attained the age of fifteen, he began breeding and trading of cattle, continued this business with a moderate success until the fall of 1851 when he determined to remove into Crawford County, Pennsylvania with his money, \$5,000. In the spring of 1855, he entered into co-partnership in the general mercantile trade, with George B. Delemater, who afterward was elected the State Senator from the Crawford district, and then was a resident of Townville. They were engaged in the manufacture of “shooks” for the eastern market in addition to mercantile operation, and the both businesses went well. When information, the discovery of oil by Drake, reached Noble, he became deeply interested in oil and determined to visit Titusville with two other partners to see the wonderful phenomenon of “pumping oil out of the ground”. They saw the operation of Drake Well before their very eyes, and made up their minds to embark on an oil business convinced of its great possibilities. Immediately, they organized an Oil Company, to which Noble and Delemater each contributed \$3,000 and L. L. Lamb \$2,000. Noble went to Titusville, secured leases upon the Stackpole farm and the Jones farm, and prepared to drill as a superintendent. In the spring of 1860, two wells were drilled with a spring-pole power upon these leases, but both proved to be dry holes. Three wells were put down on the newly secured Hamilton McClintock farm in 1861-62, two of which produced ten or twelve barrels per day, but they were probably not commercial wells, and the third was dry.

35) As to the Sherman Well, I referred following books.; *Derrick's Hand-Book of Petroleum*, vol. I, p. 26; Eaton, *op.cit.*, pp. 148-149; Henry, *op.cit.*, pp. 224-225; Wright, *op.cit.*, p. 123; Herbert Asbury, *The Golden Flood: An Informal History of America's First Oil Field*, New York, 1942, p. 96.

36) Wright, *ibid.*, p. 123.

In the spring of 1860, Noble secured a lease of 16 acres on the Farrel farm. For this lease, valid for 20 years, he paid a \$600 bonus and one-fourth of the oil. Shortly after, a derrick was erected, a spring pole prepared, and labor of drilling began. Using spring-pole power, the well reached the depth of 134 feet, which was required by the lease agreement as the minimum depth, in the fall of 1860, but no oil, and not even a show of oil was visible. He was forced to abandon this well, and three years later, he contracted with Samuel S. Fertig of Titusville for drilling the same well again. As a part of his payments for the labor, Noble assigned to him a one-sixteenth of working interest. Then, Fertig began to deepen the well using a ten horsepower steam engine. One day in May, 1863, while he was drilling at the depth of about 450 feet, oil and water suddenly burst forth, that is, a big oil reservoir was tapped. Soon, an important operation, "well completion" had to be performed by attaching tubing and stopcock. Tubing pipes prepared by Noble were inserted into the well, and a stopcock was put on the wellhead. Thus, the well completion process was finished, and it was brought under control. The Noble and Delemater Well commenced flowing oil at the rate of 2,000 barrels per day, as estimated at the time, and ceased on 28th day of February, 1865. The entire product and the total profits of this well were, according to Henry's estimate, 480,000 barrels and \$2,800,000, respectively. Contrary to this fabulous profit, the first investment in sinking well was only \$4,000, as Cone & Johns estimated. One-quarter of the total profits was paid to the land interests, owned by the Farrel clan. The remaining three-quarters were fairly and equitably divided according to the interest owned, among the ten or twelve fortunate possessors.³⁷⁾

The Sherman and Noble cases depict a contrastive two-kind type of a typical oilman during the Oil Rush. In contrast to Sherman who had to commence the drilling under very poor conditions, Noble had already made considerable money in the cattle trading business. The reason why Noble could continue the oil business in spite of his repeated failures in drilling, should be derived from this point. Partly because Noble drilled in some places on the Oil Creek, the drilling operations were done by day laborers, but on the other hand, Sherman and his partners performed the whole operations by themselves without drilling any dry hole. In his case, the key to success laid in the disposal of the one-sixteenth interest in the well. It is worthy of attention that there was financial means, taking the form of disposal of interests, for such a poor oilman as Sherman. Surely, Noble's monetary superiority was able to constitute a sufficient condition, but not a necessary condition to strike oil.

Thus, generally, in the then crude-producing sector, judging from its organization of labor and technique, drilling costs, and the successful example of oilmen, it was possible for them to operate wells under such a small organization, with limited means, as a petty industry, and to make a fortune, if things went well. Surely the rush made by many people

37) As to the Noble & Delamater Well, I referred following books.; Henry, *op.cit.*, pp. 375-392; Cone & Johns, *op.cit.*, pp. 276-277; Wright, *ibid.*, p. 121; *Derrick's Hand-Book of Petroleum*, vol. I, pp. 32, 38.

seeking oil with limited resources signified the Oil Rush, but as a premise of this phenomenon, the petroleum market had to be extended by the medium of active business management of the downstream sector: petroleum refining, transportation (especially, railroad capital) and so on. Therefore, it is safe to say that the interest of oilmen making a fortune at one time in the oil field was coincidental with that of downstream sectors. In such situations, oil upstarts were borne, and they became an envy of other oilmen, and constituted an important promoting factor of the Oil Rush. However, instances of oil upstart such as Sherman and Noble were not so common. Notwithstanding oil wells were drilled as many as from one hundred to four hundred per month through the 1860's and 70's, the number of oil upstarts appeared in some documents were comparatively small.³⁸⁾ In addition, Cone and Johns made clear the fact that 2,955 out of 5,464 wells, namely 54% of all the wells, which were surveyed by them in 1869, proved to be unproductive. Even of the rest of 46%, the petty pumping wells which produced only a few barrels per day were in the majority, and some of them could not pay even the pumping costs, while the number of flowing wells was not many.³⁹⁾ This situation is implying that speculative wildcatting performed by many oilmen resulted in disappointment, contrary to their expectation, as I will show much more clearly later. But it is a superficial view to understand this phase, the noisy rush of numerous oilmen into the Oil Region and the failure of them in a large number, as the only result of the high possibility of entrance and the impossibility or difficulty of success in a large number in the crude-oil producing business. Now, we will discuss the Oil Rush from a viewpoint of the landed interest and oilmen in the following.

III. Seeking for Land

Needless to say, since most of crude-oil exists in subterranean strata, what people, who came to the Oil Region seeking oil, had to do the first was to hold a land, by any means, under which petroleum was supposed to be endowed. Because the crude production is primarily regulated by land conditions, land ownership constitutes a matter of critical significance in that business. On the other hand, from the landed interest's standpoint, only the drawing of a small number of relatively rich persons such as Noble proved to be hardly enough for the realization of their landownership from an economic viewpoint, therefore, it became an urgent matter for them to involve as many oilmen with limited means as possible into the wildcatting process. Here, the landed interest came to be a powerful factor that could accelerate the Oil Rush. And at the same time, that interest accelerated an exploiting process of oilmen also. To conclude in advance, while oilmen embarked on the crude-producing business by acquiring some land-holding forms such as lease and sub-lease, the landed interest accelerated Oil Rush vigorously through the medium of these

38) Tarbell, *op.cit.*, vol. 1, p. 36; Henry, *ibid.*, p. 220. About other oil upstarts, see Henry, *ibid.*, pp. 224-242, pp. 323-586.

39) Cone & Johns, *op.cit.*, pp. 510-527.

land-holding forms, and then, caught scores of oilmen into their base of exploitation. In this chapter, we discuss about these functions of the landed interest at first and mention to the problem of land speculation in the next place.

Leasing Lands

Soon after the success of Drake Well, as the oil development on the Oil Creek was hastened, the land located in its neighborhood came to be purchased or leased one after another. But even when the whole of farm, contained dozens of acres to hundreds of acres, or a part of farm was purchased (strictly speaking, transfer of fee simple), pieces of the land were generally leased to some other people afterward.⁴⁰⁾ In fact, according to a later year's data, of the total of 1.56 million acres of oil property in 1890, approximately four-fifths was leased.⁴¹⁾ As for the reasons of this, it can be suggested that landowners who had lived for a long time in the Oil Region had no intention to embark on risky oil business by taking the trouble to spend their money, and that they expected their land should be sold (or leased) at higher price in the future. In addition, because exorbitant prices of fee simple, rising year by year, were quite common in the Oil Region, oilmen with limited means were forced to make a lease contract. From the viewpoint of economics, "The expenditure of money-capital for the purchase of land, then, is not an investment of agricultural (mining) capital. It is a decrease *pro tanto* in the capital which small peasants (producers) can employ in their own sphere of production."⁴²⁾ In other words, the direct producer, namely, oilmen avoided lying their capital idle in lands, as it were. As to the development of leasing, as I have referred above, generally, since the flat lands on the Oil Creek had been known as the most promising oil-bearing area with strategic superiority in transportation, they were leased up immediately, and then, the movement of land leasing reached into the inferior lands including hillsides and so on. Although the technique of oil exploration, by which drilling sites or lease lots are selected, has greatly advanced in the present day, there was a total absence of such knowledge, and oilmen had to depend on their experience and intuition in selecting well sites in the 1860's and 1870's.⁴³⁾

Now, we examine details of the lease agreements here. The landowners in the Oil Region authorized their lessee to have a "working interest" or a mineral right on the con-

40) Eaton, *op.cit.*, p. 73.

41) U. S. Department of the Interior, Census Office, *Report on Mineral Industries in the United States at the Eleventh Census: 1890*, W. G. P. O., 1892, p. 434, cited in Williamson & Daum, *op.cit.*, p. 760.

42) Karl Marx-Friedrich Engels Werke, Band 25, Das Kapital. Kritik der politischen Ökonomie. Dritter Band. Buch III: Der Gesamtprozeß der kapitalistischen Produktion. Herausgegeben von Friedrich Engels. Institut für Marxismus-Leninismus beim ZK der SED, Dietz Verlag, Berlin, 1964, S. 818. (Karl Marx, *Capital, A Critique of Political Economy*, Foreign Languages Publishing House, Moscow, 1959, vol. III, p. 790.) () in the quotation were added by the author.

43) Cone & Johns, *op.cit.*, pp. 117-119; Eaton, *op.cit.*, chap. VIII; Wright, *op.cit.*, pp. 61-63.

dition that he or she should fulfill requirements in the articles of agreement, namely lease. What the lessee were required in compensation for a mineral right in the provisions of lease were, mainly, bonus and royalty, as seen in the Noble and Delemater Well. Bonuses were paid in cash just as the lease agreement was concluded or when the lessee would become payable. On the other hand, a proportion of the crude-oil produced was periodically sent to the owner of the soil as a royalty. First, as for bonus, while only \$200 was needed even for the promising flats on the Oil Creek in 1860, soon after, as high as \$4,000 in return for single-acre leases became common on the Cherry Run valley, a newly developing area, in 1864, and moreover, \$4,000-\$10,000 was required for half-acre leases in the Pithole district, a typical boom field, in 1865.⁴⁴⁾ Secondly, as for royalty, in the early times, that is, in 1859, some leases stipulated a royalty payment as low as one-twelfth or one-tenth of production. But soon these terms became rare: the royalty increased to one-quarter or one-third by 1861, and then reached to one-half or further more by 1865.⁴⁵⁾ The average acreage of leaseholds in promising lands ranged from one to eight acres in the early part of 1860's, and soon was cut in half in 1865. In the 1860's most leases were valid for 10 to 20 years, but a short-period lease, a few months to ten years long, came to be common during the 1880's.⁴⁶⁾ During the mid-1870's, with the introduction of the practice of leasing large blocks of promising oil land for an annual rental, a tendency to standardize royalty payments at one-eighth came to be clear.⁴⁷⁾

Although these data give only general information, not a firm estimate, it can be deduced that a differential rent came to the front as new promising oil lands were developed year by year. Especially, when as high as one-half or more oil was stipulated as a royalty payment, as often seen in the promising lands, it was certain that the landlord made more profit than the lessee, considering the costs. If we took into consideration the existence of flowing wells, which produced thousands of barrels of crude per day without using any motive power for pumping (in this case, output of crude was not proportional to the pumping cost), this extremely severe condition of lease could be understood.⁴⁸⁾ Surely less severe royalty payment of one-eighth was introduced in the mid-1870's, but on the other

44) Gale, *op.cit.*, p. 22; Williamson & Daum, *op.cit.*, pp. 122-123.

45) Williamson & Daum, *ibid.*, p. 93; Eaton, *op.cit.*, p. 73.

46) Williamson & Daum, *ibid.*, pp. 161, 762; Gale, *op.cit.*, p. 23; Cone & Johns, *op.cit.*, p. 71; Brian Black, *Petrolia: The Landscape of Pennsylvania's Oil Boom 1859-1873*, Ph. D. diss., University of Kansas, 1996, pp. 90-92. Many leases say that lease remain renewable as long as oil is produced in paying quantities. Because lessees were authorized to remove all his properties, as the trade fixtures, from the land at the end of lease, landowners were concerned about a decrease in land value caused by it. Especially, careless removal of the important devices to maintain the well such as tubing, casing meant collapse of well. Oil Lease from Henry Fisher to A. S. Allshouse & R. A. Paughome, June 1st, 1887. This oil lease is preserved in Library of the Drake Well Museum (DW79.16.21). The data above mentioned include not only the cases of lease, but also sub-lease.

47) *Derrick's Hand-Book of Petroleum*, vol. II, pp. 201-203, 207.

48) Giddens, *The Birth of the Oil Industry*, chap. VI.

hand, the length of lease was markedly shortened. From the standpoint of landlords, this trend means, economically, that they anticipated the second form of differential rent, and at first they set the royalty payments at lower standard to create an active petroleum development. And from the standpoint of the lessee, they foresaw the instability of oil production, and intended to avoid a possible risk involved in long term leases.

In addition to the above, there were many important provisions in the leases. The following are the representations of the provisions: 1st. The royalty payments of the oil should be barreled free and sent to the landlord by the responsibility of lessee. 2nd. Lessee has to begin drilling a well within a given period of time (10 days) from the date of covenant. 3rd. The drilling work should be prosecuted with due diligence to completion or abandonment. 4th. Lessee must not suspend the drilling operation for a given space of time (30 days). 5th. Lessee has to continue the drilling until he reaches to the stipulated depths.⁴⁹⁾ Since the strikes of flowing wells caused really low prices of oil and the high price of barrels in the early days when gathering pipe-line was not in common, the 1st. provision constituted a main annoyance for the lessee (producers), and some of them were forced to abandon their wells in disappointment.⁵⁰⁾ In fact, according to the estimate of Rolland Harper Maybee, the price of barrels ranged from \$1.50 to \$ 3.50, depending on the quality, while the price of crude oil often declined as low as below \$3 a barrel.⁵¹⁾ When the lessee failed to fulfill above stipulations, the lease contract became null and void, then he suffered the loss of the lease by forfeiture, and the full control of the land reverted to the owner. Observing these conditions of lease in 1861, T. S. Scoville, an early visitor to the Oil Region, wrote: "My opinion is, that the landowners are grabbers; with the disposition to bless themselves and curse the world generally."⁵²⁾

As the petroleum development extended beyond the Oil Creek valley in the mid-1860, the matter of leasing land for oil purposes amounted to a monopoly in some sections through the interest of land speculators, as will be detailed later.⁵³⁾ Because the pioneers of petroleum in newly discovered areas, as a promising oil field, had usually leased lands on a large scale, often an entire farm, at a reasonable price, the late-comers had no alternatives but to purchase a portion of existing leasehold or sub-lease a small lot. Needless to say, it was impossible for small oilmen to purchase big leasehold for an enormous sum of money. Moreover, even the purchase of a portion of existing leasehold should be a difficult deal, because the existing leaseholder should require an exorbitant compensation for

49) *Ibid.*, pp. 63-64; Gale, *op.cit.*, p. 23; Oil Lease, *op.cit.* The data shown in () were cited from this lease.

50) Eaton, *op.cit.*, p. 74.

51) Rolland Harper Maybee, *Railroad Competition and the Oil Trade, 1855-1873*, Mount Pleasant, 1940, p. 242. As to the trend of crude prices, see a Table shown in F. H. Taylor (ed.), *Derrick's Handbook of Petroleum*, Oil City, 1884, p. 51.

52) Giddens, *Pennsylvania Petroleum*, p. 217.

53) Eaton, *op.cit.*

possible rent which otherwise would be acquired in the future. Under these circumstances, sub-leasing, a practice introduced into the Oil Region as early as 1860, became wide-spread.⁵⁴⁾ In this practice, the leaseholders subdivided their lease into small parcels of land, namely, sub-leasing lots, and then they were re-leased to other parties under severer provisions in general.⁵⁵⁾ This sub-leasing provided a way to enter into production for persons with limited resources, and on the other hand, it met the demand of landlords who intended to concentrate as many wells as possible at their property without bearing high drilling risk and costs. In 1865, sub-leasing was seen as a basic feature of the Pithole Creek valley where two-thirds of the total output of crude in the country were produced in September,⁵⁶⁾ however, the existent historical sources about sub-leases are so rare that I can suggest nothing but a representative case in the Thomas Holmden farm.

The former employees of Humbolt Refining Company of Plumer and prominent oilmen, Isaiah N. Frazier and James Faulkner, Jr. leased some tracts, including the Thomas Holmden farm of 150 acres, for the purpose of getting oil in March, 1864, and the next month, they organized the United States Petroleum Company with Frederick W. Jones and J. Nelson Tappan, a rich group from New York City. Fifty thousand shares at ten dollars per share were issued, giving a potential capital of a half million dollars. The U. S. Petroleum Co. took over the leases of Frazier and Faulkner on its organization and the term of this lease was 20 years and the royalty was 25% of all oil acquired. In the following June and July, the Thomas Holmden farm, mainly its bottom land part on Pithole Creek, was correctly surveyed and then divided into 77 lots by the experienced surveyor, Henry Ramsay, then immediately those lots were put on the market. Owing to a discovery well, namely, the Frazier Well, completed by the U. S. Petroleum Co. on January, 1865 and flowed oil at the rate of 900 barrels per day, over 60 half-acre sub-lease lots could be sold easily by December, 1865 for one-half of all oil as a royalty and \$3,000 as a bonus. It should be noted that the location of land, an oil boom area, made bonus payment such a high figure as \$3,000 even for a petty sub-lease. From that time on, petroleum developments on these sub-leases advanced so smoothly that many flowing wells, such as the Twins Well (crude output: 800 barrels per day) completed by Kilgore & Keenan soon after the success of the Frazier Well, came into existence and brought enormous profits to their interests. As a consequence of these spectacular performances in the Thomas Holmden farm, the stock prices of the U. S. Petroleum Co. in the New York Stock Exchange skyrocketed from \$6.25 to \$40 a share by the end of January, 1865.⁵⁷⁾

54) Gale, *op.cit.*

55) Black, *op.cit.*, pp. 92-93; Williamson & Daum, *op.cit.*, p. 93.

56) *Derrick's Hand-Book of Petroleum*, vol. I, p. 51. That is, of the estimated total output, 9,000 barrels per day, Pithole and vicinity supplied 6,000 barrels.

57) As to the Thomas Holmden farm and the United States Petroleum Company, I referred the following materials: The United States Petroleum Company, *Prospectus*, 1865 (338.27 Un3.c3 DW 90.23.3; In fact, this prospectus was written sometime in October to December, 1864.), The United States

Besides sub-leases, there was another way to enter into crude-production. This method was called “share in well” or “interest in well”, which took the form of some ratio of working interest, mostly, one-sixteenth or thirty-second, and each was sold at about \$1,000. When the well with divided interests proved productive and began to make a profit, holders of interest got a profit in proportion to their holdings. This practice should have given an important means of both spreading the risk and financing working capital to crude-producers, and on the other hand, it should have provided a good opportunity to have a connection with production for persons who were forced to give up entering because of lack of enough money. Concerning this point, we should remember the case of the Sherman Well.⁵⁸⁾ However, sometimes “shares in wells were divided and sub-divided to as little as 1/128 interest and sold at prices that frequently would have yielded no return even from a strike of 1,000 barrels daily.”⁵⁹⁾

As to leases, some points can be deduced from the above mentioned facts. First, both the marked increase of rent, keeping pace with the expansion of sub-leases, and the reduction of the term of leases led oilmen to intend to get as much oil as possible within a short term, and as a result, stimulated over-drilling. Generally, since prosperous oil lands (or farms) were sub-divided into extremely small sub-lease lots just like a mesh of a net, tendency to extract more oil than competitive neighbors as soon as possible was strengthened. A fact that as many as 150 wells clustered on a few acres represented this situation.⁶⁰⁾ Sometimes some conservation measures were suggested to avoid ruinous, inefficient over-drilling, but the results were disappointing, particularly as many absentee landowners, ignorant of the problems and interested only in immediate returns, refused to participate in such long-sighted measures.⁶¹⁾ Second, taking the form of sub-leases and interests in wells, the ways to the entry into crude-production were paved for persons with limited resources. Although the details about individuals are not clear, judging from con-

Petroleum Company, *Annual Report*, December, 1865 (338.27 Un3r DW 90.23.2), C. C. Leonald (“Crocus”), *The History of Pithole*, Pithole, 1867, pp. 7-11; William Culp Darrah, *Pithole, The Vanished City*, Gettysburg, 1972, pp. 5-28; Giddens, *op.cit.*, pp. 127-132; Cone & Johns, *op.cit.*, pp. 367-371.

58) Paul Lucier, *Scientist and Swindlers: Coal, Oil, and Scientific Consulting in the American Industrial Revolution 1830-1870*, Ph. D. diss., Princeton University, 1994, p. 415; Giddens, *The Birth of the Oil Industry*, pp. 132-133; Asbury, *op.cit.*, p. 184.

59) Williamson & Daum, *op.cit.*, pp. 123-124.

60) *Ibid.*, p. 93. In the case of flowing well, producing costs, as a whole, are seldom influenced by the operating ratio of well whether it is 50% or 100%. This is an essential factor of over-drilling. Seki, *op.cit.*, pp. 197-198.

61) *Oil City Register*, May 11, 1865; Williamson & Daum, *op.cit.*, pp. 162-163. “As a result of growing public demand, the state representative from Venango County introduced the first bill to regulate tubing and plugging of wells in the 1867 session of the legislature, only to have it tabled. While this was the first move in subsequent agitation for legislation that resulted in the first plugging law passed in 1878, another half-century or more was to pass before effective measures for conservation came into operation.”

temporary publications, not a small number of people who came to the Oil Region seem to be men of small savings, as in the case of Sherman or the Forty-niners in Gold Rush. In short, there were measures to suck up the small money from them. Third, an authority of landed proprietorship (or holdership) was exercised drastically. As shown in the case of monopoly of land-leasing in hopeful oil lands, the landed interest imposed exceedingly severe stipulations of leases and sub-leases to oilmen by using their power of the land monopoly. We should be reminded that royalties often amounted to as high as over one-half of the oil (barreled free). Differential rent, absolute ground-rent and monopoly rent can be formed in oil lands, but in addition, theoretically, it was highly possible that rent absorbed some part of profit for oilmen by such a function as seen in the case of peasantry (or transitional) rent.⁶²⁾ As to an actual management of a well, leases stipulated such detailed clauses down to the diameter of well. Here the relationship between landowners and crude-producers was twisted to be advantageous to the former. That is, the landed interest did not only choose good crude producers through the competition between oilmen to acquire rent effectively, but also controlled the land (well) management by putting various clauses in the lease. In other words, the landed interest remained never in a position of passive recipient of rent, instead, they functioned positively to insure their economic realization. And they had to do so as the recipients of royalty, namely, virtual crude-producers. In this point, however, the landed interests were in a dilemma. They intended to maximize their rent income or oil production within a stipulated period by imposing severe conditions of contract on oilmen, but at the same time, they had to keep wells or lands in fair preservation on the basis of definite-term lease. We see here an incompatibility of both over-drilling and conservation of wells, but the landed interest coped with this problem using many fraudulent measures. That is to say, in several cases, wells, abandoned probably as a result of desperate competition of crude-production or simply of failure in striking oil, were connected by means of underground pipes with tanks of oil from a distance. When the prospective buyer came to ascertain the value of well, or land, the subterranean pipe was opened, oil run into tubing, and pumped up as if its well and vicinity had a rosy future.⁶³⁾ Fourth, as a result of the wide-spread practice of sub-leases and interests accompanied by the growing of land value, land transactions became increasingly complicated, thus, land speculators came to be able to find their business opportunity easily in a great number of sub-divisions and small interests.

62) As to a theoretical definition for various kinds of rent, see Marx, *a. a. O.*, S.627-821. Generally, landowners prepared the road in leases for the convenience of lessees and permitted them to use woods, gas, water and so on for various purposes. Hence, it is safe to say that landowners provided the de facto means of production, and at the same time, the basis of peasantry rent. See, for example, Oil Lease, *op.cit.*

63) Giddens, *op.cit.*, p. 133.

Land Speculation and “Oil Stock Company Epidemic”

There is no difficulty to associate the oil boom with land speculation. Oneday suddenly a countryside was developed as a oil field and at the same time the value of land skyrocketed. This was a very common phenomenon in the Oil Region. Generally speaking, land speculators were harmful to real producers, oilmen, for they purchased or leased a tract by some means or other without any intention to begin petroleum development, and as soon as the time was ripe, they began to sell it to oilmen at exorbitant prices anticipating a possible demand for it. As the price of crude rose rapidly from 1864 to 1865 under the strong influence of galloping inflation, the speculative fever in oil lands reached its crest. We discuss this fever in a few instances.

What we must take up first of all is the said United States Petroleum Company. Although this company tends to be considered as one engaging in petroleum development, not in land speculation, on the contrary, this understanding is totally false. Surely, a remote land, Pithole oil district, was pioneered by the U. S. Petroleum Co., but strictly speaking, the success of the Frazier Well sparked off the rush into this area. In fact there had been no producing well in this area until then. Therefore the memorable success of the Frazier Well was totally due to the Company. But since this oil strike, interestingly enough, the Company did neither intend to expand its drilling operation nor drill even one productive well.⁶⁴⁾ The Company’s *Annual Report* of December, 1865 says “The Frazier Well is the only well on this farm bored, by the Company. All the others, amounting to 124, bored and being bored , are in hands of lessees of the Company.”⁶⁵⁾ Here, we are reminded of the above mentioned severe stipulations in sub-lease including a bonus as high as \$3,000 and a royalty payment at one half. In short, the active drilling operations, which were begun immediately after the organization of the Company, functioned as an indispensable process for the formation of land value in the Thomas Holmden farm.⁶⁶⁾ In fact, by

64) Although Giddens understood that very prominent Twin wells Number 1 and Number 2 were both completed by the Company, this was doubtless a misunderstanding. The Twin wells were completed by the Kilgore, Keenan & Co. *Ibid.*, p. 130; Cone & Johns, *op.cit.*, p. 368; Darrah, *op.cit.*, p. 9.

65) U. S. Petroleum Co., *Annual Report*, p. 2.

66) We can see the most important purpose of the Company in the Prospectus, which says “As soon as the maps (of lease lots) are completed, and copies placed on file in the office of the Clerk of Venango County, the Company propose to dispose of parts of their large property, by leasing lots or parts of farms, or selling rights in lots or parts of farms. This policy, properly managed, will result in having a great number of wells sunk during the coming year.” *Prospectus*, p. 7. After the success of Frazier Well, the only business the Company had to do was the arrangements for sub-leasing more land: with the continual surveying of Thomas Holmden farm by Henry Ramsay from 1864 to 1866, the number of sub-lease lots increased gradually. By the completed maps of sub-divisions, we can ascertain that the number of sub-lease lots increased to as many as 258 at the maximum time.

December, 1865 the U. S. Petroleum Co. earned about \$176,000 by selling sub-lease lots in the Thomas Holmden farm, and total recipients, including sales of oil, amounted to over \$600,000.⁶⁷⁾ It is the characteristic of this case that in the undeveloped area, the Company had to trigger an oil boom by drilling a discovery well by its own effort to realize a big profit. In relation to this point, I give another example, the Rooker farm (including 100 acres), which was located immediately south of the Thomas Holmden farm. Jesse Rooker, the landowner of Rooker farm, had sold the Rooker farm to J. W. Bonta, James A. Bates and others for \$280,000, but they did not have any intention to drill by themselves, but instead divided the farm into one hundred and eighty half acre leases and began to sell them at the average bonus of \$3,500 and one-half of all produced oil. In less than two months from the date of covenant, more than ninety leases were sold. In this case, they did not have to bring about the Oil Rush by themselves because they could take advantage of the Oil Rush that had been broken out by the U. S. Petroleum Co. already. This is a completely different point compared with the case of Thomas Holmden farm. Shortly after, the Rooker farm was sold to the Prather Pithole Oil Co. for \$350,000. And then the Prather Pithole Oil Co. began to sell the lease lots for \$5,000 to \$7,500 and one-half of all produced oil. Attention should be given to the point that the terms of leases became very exorbitant among the heating speculative oil boom. As a result of the second purchase, without drilling any well, Bonta and his partners got \$70,000 as a margin of land value, and in addition, their receipt of royalty amounted to \$315,000 by the date of purchase.⁶⁸⁾

According to the survey of farms in the Oil Region, made by Cone & Johns in the end of 1860's, the number of farms which divided into small sub-division and held by scores of lessee (including sub-lessee) amounted to thirteen out of twenty two farms which had an area of over twenty acres, located on the Pithole Creek and had the specified land holding manner. The rest, nine farms, were directly owned by the joint stock companies, and there was no producing well in these farms even though traces of drilling operations were left. And interestingly, all of twenty two farms were held and managed by the petroleum producing companies, not land companies.⁶⁹⁾ These facts make it possible to apply a few individual cases mentioned above to the entire Oil Region as a general situation in crude production. That is, in the Oil Region, the "petroleum company" often represented a company engaging mainly in land speculation. These companies were active behind a complicated and inflated land transaction: they sub-divided the lands including even valueless ones, fixed the land price at high level but somehow payable for oilmen, sucked up their small money, and made an enormous amount of profit.

The speculative boom expanded its influence so quickly that it went over the confines

Henry Ramsay, *Map of Thomas Holmden Farm leased to the U. S. Petroleum Co.*, 1866. (Map # 83 preserved in the Library of Drake Well Museum)

67) *Annual Report*, p. 15.

68) *Derrick's Hand-Book of Petroleum*, vol. I, pp. 49-50; Leonald, *op.cit.*, pp. 13-14.

69) Cone & Johns, *op.cit.*, pp. 358-381.

of the Oil Region soon and created a nationwide “oil stock company epidemic” in 1864 and 1865. By September, 1864, mainly in the Eastern large cities, more than 100 stock companies were organized with a nominal capital of over \$52 million; by February, 1865, their number exceeded 500 with an aggregate capital of over \$356 million.⁷⁰⁾ Although the business activity performed by these companies have been almost ignored or made vague hitherto, this “oil stock company epidemic” can be considered as a phenomenon that a number of parties having only intention to engage in land speculation were organized as joint stock companies.⁷¹⁾ Because the average nominal capital of \$660,000 per company in February, 1865, almost agrees with the average capital of land speculating companies in the Oil Region, about \$500,000 to \$600,000, and moreover, these companies sold their stocks in New York, Philadelphia, Boston, and so on. Readers should be reminded of the United States Petroleum Company whose stocks were sold at the New York Stock Exchange. In addition, a fact that these speculative companies acquired their landed property in the Oil Region mainly in 1864 and 1865 is implying the time when the companies were organized,⁷²⁾ for generally they secured the lands immediately after or before the organization to promote the subscription. As an example of these companies, here I give the case of the New York Oil Creek Petroleum Company in addition to the U. S. Petroleum Co. The Company was organized on August 24, 1864 in New York with a nominal capital of \$500,000. The prospectus says that immediately the Company are to drill a well in their landed property (contains 81 acres; located in the north of Titusville) and also to embark on leasing business positively.⁷³⁾ Contrary to the description of the prospectus indicating only a rosy future, no petroleum in paying quantity must be found continuously because no record about the Company has remained except for the prospectus. Putting all business activities of “petroleum companies” mentioned above together, we can draw a rough sketch of the general business behavior as in the following order; 1st. Purchasing or leasing the promising land in the Oil Region → 2nd. Raising necessary capital in the Eastern large cities → 3rd. Developing the landed property, in other words, sinking a discovery well, and creating the high land value → 4th. Using oilmen’s small money to expand drilling operations, and sucking up their money. Actual drilling operations, namely 3rd., had only a pump-priming function, as it were, and it was not always necessary process because sometimes high land value had been already created. Thus oilmen came to be exploited from the aspect of land speculation. And at the same time, this situation over oilmen represented an embodiment of the landed interest which accelerated the Oil Rush actively.

70) *The Venango Spectator*, February 22, 1865.

71) As to the formative process of such joint stock companies, see Eaton, *op.cit.*, pp. 236-248; Lucier, *op.cit.*, pp. 412-416.

72) Cone & Johns, *op.cit.*, pp. 194-505.

73) *Prospectus of the New York Oil Creek Petroleum Co.*, New York, 1864. (preserved in Library of the Drake Well Museum, 338.27/N4224)

IV. Conclusions

The first basic viewpoint of this paper was making clear distinction between the formative history of American petroleum industry and that of the Standard Oil's monopoly system, and examining the former as the formative process of capitalist petroleum industry. In the beginning of that work, we laid the second basic viewpoint on the crude-producing sector which has been not studied enough hitherto as the center of interest. Because neither we should be able to see a fruitful image of petroleum industry in perspective nor clarify the formative process of capitalist petroleum industry without a correct understanding of that sector. Another two basic viewpoints were relating to the landed interest's action and a unique nature of crude-producing sector itself, both of which constitute indispensable factors to analyze the crude-producing sector properly. The results of analysis on the Oil Rush, which based on the these basic viewpoints, are as follows.

The Oil Rush occurred in the process of rapid market expansion for oil and rapid growth of the downstream sectors in the 1860's, which followed the beginning of mass-production of oil by Drake. In other words, it occurred in the process in which capital was trying to seize the industry. In this process, although the mechanical drilling method used by Drake became gradually prevalent, its organization of labor and technique was so simple that necessary fund to drill a well was only several thousand dollars. This means there were only low barriers to entry into the crude-producing sector, and therefore, it constituted a precondition to call many small-producers into the Oil Region. Among these numerous small-producers or oilmen, some actually made a fortune by striking oil, and accelerated the Oil Rush more and more. However, it is considered that the number of successful oilmen who made a big money was very few and the rest, majority of oilmen failed. That is to say, the crude-producing sector assumed quite unstable structure that repeatedly induced a large number of oilmen to embark on the venture and then forced them to fail. This is the first point.

Since first of all oilmen had to acquire the land in the Oil Region, the interest of landowners was heavily involved in the crude-producing sector. Through lease hold or sub-lease hold, the landed interest exercised their authority, often enforced a number of strict stipulations of lease such as exorbitant rent (royalty) on oilmen. On the other hand, oilmen, as a response of severe conditions of lease, tended to do over-drilling to recover their investment as soon as possible and gain the maximum profit.⁷⁴⁾ In addition to forcing

74) Inefficiency of over-drilling was clear from the viewpoint of development of natural resources. "In 1915, the U. S. Bureau of Mines estimated that (as a result of over-drilling) 80 to 90 percent of the oil was left in the ground when the wells were abandoned." Harvey O'Connor, *The Empire of Oil*, New York, 1956, p. 53. This paper have dealt with the complication of economic interests as a main cause of over-drilling, however, we can not make light of an aspect of law (especially, rule of capture) which promoted competitive drilling.

severe conditions of lease, the landed interest tried to call as many oilmen as possible by subdividing their lands into small parcels of land such as one acre lease lots (readers should be remind of our fourth basic point of view), so that they could stimulate petroleum development. It is interesting that the landed interest often drilled their discovery wells positively, created (high) land prices and attracted oilmen to their “hopeful” land. In short, they created the Oil Rush and simultaneously made numerous oilmen an object of exploitation. And necessarily extensive land speculation accompanied this process. Thus oilmen, who rushed into the Oil Region with strong intention to make a fortune by oil, were at mercy of the interest of landowners. This is the second point.

With the above, the economic mechanism, which occurred and promoted the Oil Rush, was elucidated. In the formative process of modern, capitalist petroleum industry, abundant crude-oil was always supplied to the downstream sectors, but on the other hand, it meant deep involvement of the interest of landowners that promoted the Oil Rush. What we confront now is not the crude-producing sector with simple structure, as shown by the past researches, only including oilmen’s interest, but that sector of multiple, perspective structure involving the landed interest.

Taking into consideration the clarified structure of crude-producing sector, we can survey to some extent the whole structure of the American petroleum industry in the latter part of 19th century. That is, after the end of 1860’s, the petroleum industry became to be organized under the control of big business such as the trunk line railroads and the Standard Oil, while the crude-producing sector continued to have competitive structure, as we have already seen, without the interference of such interests and repeat the Oil Rush, over-drilling. This would be very favorable situation for the Standard Oil. Because anytime rich, even excessive crude-oil could be got without their commitment. In addition, since oilmen always competed each other fiercely, it was de facto impossible to fight against the monopolistic big business by such means as cartel on production. In the formative process of capitalist oil industry, the structure of crude-producing sector was preserved by intention, thus supported the foundation of big business.⁷⁵⁾ It is safe to say that

Over-drilling was not regulated until the Great Depression of the 1930’s. Then, the discoveries of huge oil fields in Texas, Oklahoma, etc. were made one after another regardless of decrease in consumption, and as a result, militia was called out to enforce production quotas. In this process, small producers who tended to dump their excess crude, were ruined. Thus the word “conservation” was used to facilitate the formation of internal petroleum cartel. As O’Connor says, “The purpose of conservation is to limit production to that level which assures the greatest profit to the biggest corporations.” *Ibid.*, p. 62.

75) Nevins, *op.cit.*, vol. 1, p. 172; Ron Chernow, *Titan, the Life of John D. Rockefeller, Sr.*, New York, 1998, pp. 80-83. The Standard Oil Company did not extensively enter into crude-producing sector until the end of 1880’s when the competition with Russian crude became an urgent issue, and a lack of plentiful source of petroleum in the U. S. came to be felt as a critical problem. But the Standard Oil’s share of crude-oil was only 15.89% in 1889, 26.22% in 1892, 33.5% in 1898, and then decreased gradually. Hidy & Hidy, *op.cit.*, chap. 7, p. 407. Reader should be reminded that the Standard Oil ac-

the landed interest guaranteed this inter-sectorial structure, in a word, the system of indirect control by big business.⁷⁶⁾

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quired 90–95% share of the refining sector in 1879. U. S. Industrial Commission, *Preliminary Report of Trusts and Industrial Combinations*, vol. II, Part I, 1900, p. 95.

76) There is an interesting case which implies the close relationship between the landed interest in the oil field and the Standard Oil Company. Henry Fisher, a landowner appeared in the above mentioned oil lease (footnote no. 45), had been one of the founders of the pipeline system. Inspired by the success of the pipeline business, he acquired some landed property, organized the Washington Oil Company in 1887 and embarked on crude-production. But by 1891, this Company's 71% shares were held by the Standard Oil. Hidy & Hidy, *op.cit.*, p. 184. In this case, the actual producers of oil were lessees, not the Standard Oil's subsidiary. It is inferred that Fisher did initial petroleum development to create the land value, and then leased parcels of land to other producers.