HISTORICAL DICTIONARY *of the*

PETROLEUM INDUSTRY

MARIUS S. VASSILIOU

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Historical Dictionary of the Petroleum Industry

Second Edition

Marius S. Vassiliou

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Printed in the United States of America.

To my wife, Cynthia K. Vassiliou,
to my mother, Avra S. Vassiliou,
and
to the memory of my father, Simos G. Vassiliou.

Chronology

c. 1875 BC References to an oil trade in ancient Sumeria appear in official records of King Hammurabi's government.

c. 450 BC Greek historian Herodotus describes oil and salt production from springs and wells in Persia.

c. 400 BC Bamboo pipes wrapped with waxed cloth are used to transport natural gas for lighting in China.

211 BC Natural gas is discovered in Chi-lui-ching, Szechuan, China, while drilling for salt and is used for heat and light.

c. 50 BC Greek historian Diodorus records roaring gas seeps at Kirkuk and presence of large quantities of asphalt in Babylonia.

347 Wells are percussion-drilled in China using bamboo poles with attached bits. Depths of almost 800 feet are achieved. Some of these are salt wells with incidental oil discoveries.

642 Byzantine emperor Heraclitus destroys a number of temples near Baku where locals worship before burning gas wells.

885–886 Premodern oil industry in Azerbaijan and the North Caucasus. Caliph of Baghdad grants revenues from oil springs to the citizens of Darband (Derbent).

1132 Wells in China reach 3,000 feet in depth.

1184 Ibn Jubayr records large oil seeps near Mosul.

1188 Giraldus Cambrensis describes rocks in Wales that appear to be oil bearing and speculates on the possibility of extracting oil from them somehow.

1298 Marco Polo observes the exploitation of oil from surface seeps on the Abseron Peninsula. He notes that the oil is used for fuel and medicinal purposes and is transported on camels.

1460 Francisco Ariosto writes of surface oil springs near Modena, Italy. The oil is used for medicinal purposes.

1526 G. Fernández de Oviedo y Valdéz uses pitch to caulk his ships near Havana, Cuba.

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1539 Spanish ship *Santa Cruz* transports a barrel of Venezuelan oil to Spain, reportedly to help treat King Charles I's gout.

1543 Hernando de Soto describes oil seeps in Mexico.

1545 Georgius Agricola mentions oil seeps near Hanover, Germany, near the site of the modern oil fields of Reitling and Hänigsen. He describes the use of oil for illumination, lubrication, and waterproofing.

1594 An inscription inside a 115-foot oil well in Balakhany on the Abseron Peninsula identifies the proprietor as Allah Yar Mammad Nuroghlu.

1595 Walter Raleigh observes the pitch lake in what is now Trinidad and Tobago.

1596 Jan Huygen van Linschoten reports oil seeps and a primitive oil industry in Sumatra.

1625 Johan Volck discusses possible uses of oil in the Pechelbronn district of Alsace, but no commercial development occurs.

1636 German diplomat Adam Oleari observes 30 oil wells in the Baku area and remarks that some of them are gushers.

1683 Engelbert Kaempfer, secretary of the Swedish embassy in Persia, visits Baku and observes the extraction, use, transport, and export of Abseron Peninsula oil.

1702 Russian Tsar Peter I (the Great) orders oil samples to be sent to him from Siberia and orders further exploration of the vast region.

1717 Tsar Peter I's physician Gottlieb Schober describes oil sources in Russia's Volga–Urals area.

1732 A small rudimentary refinery is built at Baku. Its products serve the local area.

1734 Jean-Théophile Hoeffel completes a doctoral thesis in which he describes the results of distilling light fractions from Pechelbronn bitumen and oil sands in Alsace.

1737 Fifty-two hand-dug wells are producing oil at the site of the present-day giant Balakhany field on the Abseron Peninsula.

1746 Louis Pierre Ancillon de la Sablonnière and Jean d'Amascéne Eyrénis begin mining oil sands in the Pechelbronn area of Alsace. Oil sands are brought to the surface, and the oil is washed out of them. An oil company is formed, with 40 shares issued. Fyodor Pryadunov builds a rudimentary installation to collect oil from the surface of the Ukhta River in Russia's Timan–Pechora area.

1748 Peter Kalm of Sweden publishes a map showing oil seeps in Oil Creek, in what is now Pennsylvania.

1788 Peter Pond reports that natives in the area of the Athabasca oil sands (present-day Alberta) use bitumen to caulk their canoes.

1795 M. A. Symes visits the Yenangyaung oil field in Burma, a country with a large oil industry that has existed perhaps for centuries by this time. He describes the export of oil via boat.

1806 David and Joseph Ruffner drill a salt well using a spring pole, drive pipe, casing, and tubing near the Kanawha River in western Virginia (today West Virginia) and strike oil instead.

1813 Manual research drilling is conducted at the Pechelbronn field in Alsace to depths of 640 feet to guide development of the oil sands mining operation.

1815 Oil is remarked as an undesirable by-product from Pennsylvania brine wells.

1821 A natural gas well is drilled in Fredonia, New York, and some local residences are served with gas for lighting.

1825 An order from Russian finance minister Yegor Kankrin places all oil wells under the control of the state.

1827 British geologist John Crawford investigates the Yenangyaung oil field in Burma. He describes the hand-dug wells as shafts about four feet square, cribbed with wood. Crawford estimates annual output at the equivalent of 250,000–300,000 barrels. He notes seeing about 200 boats waiting to load oil. Oil is used in the area for many purposes, including illumination, preserving wood, and boat building.

1830 Johann Lenz investigates the Baku oil industry for the Imperial Academy of St. Petersburg. He reports annual production equivalent to 30,145 barrels from 80 wells or springs.

1833 Benjamin Silliman (Senior) performs an experimental distillation of crude oil.

1835 Nikolai Ivanovich Voskoboinikov of the Corps of Mining Engineers in Baku designs and implements a ventilation system to improve the efficiency and safety of hand-dug oil pits.

1836 Gian Bianconi studies the geology of oil and gas in Italy. Natural gas is used to light the baths at Poretta.

1837 A pilot refinery designed by Nikolai Ivanovich Voskoboinikov is built near Baku.

1838 Oil is produced on Cheleken Island in the Caspian Sea from 3,500 hand-dug pits or surface seeps.

1844 A report detailing ideas developed by Nikolai Ivanovich Voskoboinikov on drilling for oil rather than digging pits by hand is presented to the Russian government in the Caucasus by Vasili Nikolaevich Semyonov.

1845 Prince Mikhail Vorontsov, first viceroy of the Caucasus, authorizes funds for oil drilling based on Voskoboinikov's ideas.

1846 A 69-foot well is drilled to explore for oil in the Bibi–Eibat area near Baku and strikes a small quantity of crude. The well is drilled under the command of Major Alexeev, based on the ideas of Voskoboinikov.

1849 Samuel Kier establishes a small refinery in Pittsburgh to process and bottle oil that is a by-product from his family's brine wells at Tarentum, Pennsylvania. He markets "Kier's Rock Oil" as a patent medicine.

1850–1856 Andrés Pico distills oil from hand-dug pits in southern California to produce lamp oil and illuminate the San Fernando Mission.

1851 Abraham Gesner develops a distillation process yielding an illuminating oil from Trinidad asphalt.

1853 Ignacy Łukasiewicz distills kerosene from crude oil and develops a lamp to burn it. On 31 July, one of his lamps provides light for an operation in Lvov's hospital. Over the next several years, Łukasiewicz produces and refines oil from hand-dug wells in the Bóbrka Forest (present-day Poland).

1854 Pennsylvania Rock Oil Company is established by George Bissell and Jonathan Eveleth. This is one of the first modern oil companies. Natural gas from a water well in Stockton, California, is used to light the Stockton courthouse.

1855 Benjamin Silliman Jr. of Yale University reports to the Pennsylvania Rock Oil Company on his distillation experiments on Pennsylvania crude oil. He concludes that crude oil can be distilled to obtain a range of useful products, including kerosene for illumination.

1857 James Miller Williams strikes oil with the Williams No. 1 well, Enniskillen Township, Ontario, and begins refining the oil to produce kerosene in 1857 or 1858. Some call Williams No. 1 the first modern well in North America, but it is not clear from Williams's records if his early wells were drilled or were dug by hand and cribbed. Michael Dietz invents a kerosene lamp.

1858 Seneca Oil Company of New Haven, Connecticut, is formed as a result of disputes within the Pennsylvania Rock Oil Company and takes over the petroleum exploration effort in Pennsylvania. Seneca hires Edwin Drake. The world's first modern natural gas company, the Fredonia Gas and Light Company, is established.

1859 Successful oil wells are drilled in West Virginia by Robert Hazlett's Virginia Petroleum Company and by Charles Shattuck. Edwin L. Drake strikes oil at a depth of about 69 feet with his well near Titusville, Pennsylvania, for the Seneca Oil Company.

1860 The steamboat *Venango* carries the first load of petroleum to Pittsburgh.

1861 Thomas Sterry Hunt and E. B. Andrews independently elucidate the anticlinal theory of petroleum trapping in geological formations. McClintock No. 1, the oldest continuously producing oil well in the world, begins producing near Oil Creek in Pennsylvania, not far from the Drake Well.

1865 Latin America's first successful oil well is drilled in Peru's northwestern coastal region, discovering the Zorritos oil field.

1866 Atlantic Petroleum Storage Company, the ancestor of Atlantic Refining Company (eventually part of Atlantic Richfield), is established. Vacuum Oil Company, an ancestor of Mobil, is established. Oil is collected from tunnels dug at Sulphur Mountain in Ventura County, California, by the brothers of railroad baron Leland Stanford.

1868–1873 The world's first giant oil field, La Brea (also called Negritos), is discovered in the northwestern coastal region of Peru.

1870 Standard Oil Company is founded by John D. Rockefeller in Cleveland, Ohio. Oil City Oil Exchange is established in Pennsylvania.

1871 Bradford field is discovered in Pennsylvania near the New York border. Rangoon Oil Company (antecedent to Burmah Oil) is established.

1872 Tsar Alexander II establishes new rules for the oil industry, auctioning oil leases to private investors, including foreigners. A boom begins in the Russian oil industry.

1874 Atlantic Refining becomes affiliated with Standard Oil.

1875 Continental Oil and Transportation Company is founded in Ogden, Utah. This company eventually becomes Continental Oil, Conoco, and ConocoPhillips. The Nobel brothers (Ludvig and Robert, with Alfred of Nobel Prize fame as a partner) begin activities in Baku oil industry.

1980 Average oil price nears $37/b, a level not again reached in nominal terms until 2004 (in 2016 dollars, 1980 prices averaged over $107/b). U.S. Congress establishes Arctic National Wildlife Refuge (ANWR). Most of the refuge is closed to petroleum exploration and development, with the exception of the "1002 Area" near the Beaufort Sea. Saudi Arabia completes acquisition of Aramco. Iran–Iraq War begins when Iraq invades Iran. Iran acquires the assets of all four successful joint ventures (SIRIP, IPAC, LAPCO, and IMINOCO) that were outside the framework of the 1954 consortium agreement. The assets are taken over by the new Iranian Oil Offshore Company (IOOC). Elf Aquitaine begins tests of horizontal drilling in European oil fields.

1981 Aramco completes construction of the Petroline pipeline from Abqaiq to the Red Sea port of Yanbu.

1982 Exxon and Tosco's Colony Oil Shale Project in Colorado is canceled because of technical difficulties and falling oil prices. U.S. Steel acquires Marathon Oil Company. Occidental Petroleum acquires Cities Service Company. Tunisia joins OAPEC.

1983 Ali al-Naimi becomes the first Saudi president of Aramco. *Oil and Gas Journal* begins the OGJ400 (later OGJ300 and OGJ200) tabulation of the largest U.S.-based petroleum companies. The journal will also publish the OGJ100 list of the largest petroleum companies headquartered outside the United States. Union Oil Company of California becomes Unocal.

1984 Standard Oil of California acquires Gulf Oil Corporation and changes its name to Chevron. Pennzoil agrees to acquire three-sevenths of Getty Oil. Texaco steps in and acquires all of Getty. Pennzoil sues Texaco for tortuous interference. This will result in a record jury award of $10.5 billion in damages to Pennzoil.

1985 Compagnie Française des Pétroles becomes Total Compagnie Française des Pétroles. Standard Oil Company of Indiana becomes Amoco. Petrobrás discovers Marlim and Marlim Sul in the offshore Campos basin.

1985–1986 Oil Countershock: Saudi Arabia gives up singlehandedly trying to defend the price against market pressures. It increases production and offers attractive netback pricing. Oil prices drop to a low of about $8/b during 1986.

1986 Iraq bombs Iran's Kharg Island oil installations and damages them severely. Tunisia requests suspension of OAPEC membership. First successful multifracture horizontal well is drilled in Wayne County, West Virginia.

1987 BP completes acquisition of Sohio. Pennzoil settles with Texaco for about $3 billion.

1988 Aramco changes its name to Saudi Arabian Oil Company, or Saudi Aramco. The "Aramco" name continues to be used informally. Iran–Iraq War ends.

1989 *Exxon Valdez* oil spill occurs in Prince William Sound, Alaska. Soviet Ministry of the Gas Industry is reorganized into a company named Gazprom. Egypt is reinstated in OAPEC. Aubrey McClendon and Tom Ward establish Chesapeake Energy with an initial investment of $50,000.

1990 Iraq invades Kuwait, precipitating the 1991 Persian Gulf War. A $120 million judgment is issued against Amoco in the case of the 1978 *Amoco Cadiz* oil spill. PdVSA acquires Citgo.

1991 U.S.-led coalition drives Iraq out of Kuwait. Total Compagnie Française des Pétroles becomes Total. USX (formerly U.S. Steel) creates a separate stock for its Marathon Oil subsidiary, USX-Marathon. Mitchell Energy under George P. Mitchell performs the first horizontal fractured well in the Barnett Shale in Texas.

1992 Ecuador suspends its OPEC membership. Gazprom becomes a joint stock company in Russia. Argentinean government begins privatizing YPF. BP discovers Cusiana field in Colombia.

1993 Russia establishes Lukoil, formerly the Soviet Union's first integrated oil company, as a joint stock company. Russia establishes Yukos, combining a number of Soviet-era assets. Russia forms Rosneft from assets previously held by Rosneftegaz, the successor to the Soviet Ministry of Oil and Gas.

1994 Gabon suspends its OPEC membership. Russia signs its first-ever production-sharing agreement with a consortium led by Royal Dutch Shell to develop oil and gas off Sakhalin Island. The license will be issued in 1996. In 2007 Gazprom will take majority control of the project. Exxon is ordered to pay $287 million in compensatory damages and $5 billion in punitive damages for the *Exxon Valdez* oil spill. A scandal breaks out in France involving corruption and embezzlement at Elf Aquitaine (later part of Total), unfolding over several years and eventually reaching to the highest levels of the French government.

1995 Venezuela begins the Apertura Petrolera by launching a suite of new policies meant to attract foreign investment in the country's upstream petroleum sector. Russia forms Sibneft by combining the Soviet-era oil company Noyabrskneftegaz, the Omsk refinery, a distribution network, and other entities. Loans for Shares scheme begins in Russia under the government of Boris Yeltsin. It will allow a small group of oligarchs to gain control of large state enterprises, including petroleum companies, for relatively small sums. Sibneft and Yukos, among others, pass into private control in this fashion.

his father, **James C. Donnell**, was then vice president and general manager. He rose rapidly through the ranks. When his father became president in 1911, Donnell became a director of the company. When his father died in 1927, he succeeded him as president. He remained president until 1948, when he was succeeded in turn by his own son, James C. Donnell II.

Donnell began a major expansion program in 1930. He bought a majority interest in Transcontinental Oil Company as well as several interests from other oil companies. He also purchased service stations. By 1948, he had nearly doubled Ohio Oil's assets. Donnell increased annual profits by nearly a factor of 10 during his tenure, to $68 million. In 1936, he absorbed a former subsidiary, Marathon Oil Company, into the parent company. Ohio Oil would adopt Marathon as its company name in 1962. Otto Donnell died 9 April 1961.

DRAKE, EDWIN L. (1819–1880). Supervised drilling an early oil well near **Titusville**, **Pennsylvania**, helping to launch the modern American oil industry. Drake's well is popularly considered the "first modern oil well," although this is an oversimplification. There were contemporaneous and even earlier efforts (*see* FIRST OIL WELL), but Drake's well and its consequences are regarded as more prototypical of the modern industry than most of the other efforts, important as they also were.

Edwin Laurentine Drake was born 29 March 1819 in Greenville, New York, and grew up in Castleton Corners, Vermont. He held several different jobs before becoming a conductor for the New York and New Haven Railroad. In 1857, he fell ill and resigned from that job, settling in New Haven to recuperate. During this period, he bought some shares of stock in the Seneca Oil Company. Seneca was an offshoot of **George Henry Bissell**'s **Pennsylvania Rock Oil Company**, one of the world's first modern oil companies. The Pennsylvania Rock Oil Company had obtained samples of crude oil from surface seeps near Titusville and sent them to Yale University for analysis. Professor **Benjamin Silliman Jr.** had reported in 1855 that the crude oil could be distilled to obtain useful products, including kerosene for illumination. The depression of 1857 stalled the company's plans. Several of the shareholders organized a new company, Seneca, and leased land near Titusville from the old company.

Drake accepted a job with Seneca to travel to Titusville and report on the site to the stockholders. He made a brief trip in December 1857 and reported positively, having witnessed the skimming of oil from Oil Creek. The stockholders sent him back in May 1858 as the general agent of the Seneca Oil Company, with the fictitious title of "Colonel" to lend him more prestige. His mission was to find a way to produce oil in quantity. Drake spent several weeks digging in the main oil spring on the Hibbard farm. Unfortunately he only struck water. Deciding to drill for oil, he traveled to Tarentum, near Pittsburgh, to observe the drilling of salt wells. He acquired a six-horsepower steam engine to power the drill, which was a cable tool that operated via percussion and not the modern rotary type (*see* DRILLING TECHNOLOGY). Drake spent the winter of 1858 constructing a derrick to support the drill. He hired William A. "Uncle Billy" Smith, a blacksmith and experienced salt driller. Their first efforts were stymied by groundwater flooding, until they cased the well by driving cast-iron pipe down the hole with an oak battering ram. They resumed drilling in August 1859, by which time the company was nearly out of money and wanted to shut down the operation.

On 27 August 1859, work stopped after the drill slipped through a crevice at a depth of 69 feet. The next day, Uncle Billy noticed oil floating at the top of the well, confirming that they had made a discovery. Drake drilled a second well nearby, striking oil at 480 feet. The first well produced about 20 bpd, the second one about 24, which are extremely low rates of production by the standards that would soon be established. A frantic oil boom followed Drake's discoveries, launching the modern U.S. oil industry.

Drake left the oil industry in 1863. He had served for a time as president of the Seneca Oil Company but was not a good manager and had been forced to resign in 1860. Although he had paved the way for others to become wealthy, he made only a modest sum, and he managed to lose even that through poor investments. In 1873, his friends in Titusville convinced the Pennsylvania legislature to provide him with a pension in recognition of his contributions to the state's economy. Drake lived with debilitating muscular illness in Bethlehem, Pennsylvania, until his death on 8 November 1880.

DRESSER, SOLOMON ROBERT. *See* DRESSER INDUSTRIES.

DRESSER INDUSTRIES. Oil field services company; later part of **Halliburton**. Dresser was founded by Solomon Dresser (1842–1911), who invented the Dresser cap packer to keep oil and water separated in a well. He did not invent the first packer, but he used rubber for a tight fit and received a patent in 1880. He sold his product in the industry surrounding the **Bradford oil field** in **Pennsylvania**. In 1885, he invented the Dresser coupling for joining pipes so that gas would not leak. Again he used rubber. The Dresser coupling helped enable long-distance **pipelines** for **natural gas**.

As the gas industry expanded, so did the company's fortunes. Dresser's descendants ran the firm after his death in 1911, and by 1927 annual revenues were $3.7 million. In 1928, the company went public. In the 1930s, it acquired a number of companies making valves, pumps, and other mechanical equipment. After **World War II**, it diversified into other oil field products, including drill bits, drilling mud, and derricks. In 1950, the company moved its headquarters to Dallas, **Texas**.

Acquisitions and diversification continued until the 1980s, when the downturn in the petroleum industry (*see* OIL COUNTERSHOCK) forced a refocusing of the organization. Dresser Industries divested divisions in areas such as insurance, construction equipment, and mining. But after 1987–1988, it resumed acquisition and diversification. In 1987, it entered into a joint venture with Litton Industries to form **Western Atlas**, which offered clients the full spectrum of upstream services from exploration to production, including **geophysical prospecting** and **well logging**. In the early 1990s, Litton bought back Dresser's share of Western Atlas and in 1993 spun it off as an independent company (later to be acquired by **Baker Hughes** and still later to be partially acquired by **Schlumberger**).

In 1988, Dresser acquired M. W. Kellogg and entered into a joint agreement with Komatsu of Japan to manufacture construction equipment. In 1994, it acquired oil field services firm Baroid Corporation and pump manufacturer Wheatey TXT. In 1998, Dresser Industries merged with Halliburton.

DRILLING TECHNOLOGY. Drilling technology originated in ancient times, motivated by the search not for petroleum but for water. Percussion drilling methods were developed in **China** about 2,000 years ago. Bamboo framework structures, similar to modern derricks, were employed to lift and drop a heavy chiseling tool. The modern cable tool operates on the same basic principle. The Chinese drilled wells as deep as 3,000 feet, although completion may have taken several generations.

At **Pechelbronn** (Alsace, France), as many as 140 manual wells were drilled in 1813 at an early oil sands mining operation that had been operating since the 18th century. The wells were not drilled to obtain oil directly but rather to guide the development of oil sands mining. In the 19th-century **United States**, salt drove the development of drilling technology. Between 1806 and 1808, David and Joseph Ruffner completed a 58-foot salt well near the Kanawha River, not far from Charleston, in what is today **West Virginia**. They used a spring pole. This consisted of a long timber pole, anchored at one end and propped on a fulcrum. A rope holding heavy chisel-type drilling tools was suspended from the free end of the pole. An operator would use stirrups to mount the pole and push it down with his legs, so that the drill bit would hit the target. The spring pole would bring the tools back up, so a new stroke could be started.

The Ruffners ushered in a vigorous salt well industry that inspired the petroleum industry. For one thing, oil was sometimes an undesirable waste product in salt drilling. **Samuel Kier**, who began marketing petroleum as a patent medicine in 1848, obtained it from his family's brine wells in Tarentum, **Pennsylvania**, near Pittsburgh.

The salt drilling industry was where the early petroleum industry obtained its drilling technology. In the 1830s and 1840s, in what is now West Virginia, salt and oil drilling operations were sometimes water powered. **Edwin Drake**, the driller of an early oil well near **Titusville** that sparked the Pennsylvania oil boom, traveled to Tarentum to observe salt drilling techniques. He also tapped the salt industry for an experienced driller, William A. "Uncle Billy" Smith, to act as a rig mechanic and blacksmith.

Drake's cable tool was descended from the spring-pole technique and the methods of ancient China. A wooden derrick, "Drake's yoke," about 30 feet tall, supported the tools. The steel bit, chisel pointed and about four feet long, was suspended from rope ("cable") and was raised and dropped repeatedly to pulverize the rock. The raising of the bit was accomplished by rocking a "walking beam," driven by a steam engine. Every three to eight feet drilled, the bit was raised and a bailer lowered into the hole to remove debris. Drake also employed casing in the hole to guard against flooding by groundwater and to keep the sides of the well from collapsing. Cable tools continued to dominate throughout the 19th century and are still used in some applications today. The "Pennsylvania" type rig had a wooden derrick, eventually standardized at 72 feet or 82 feet in height. By the early 20th century, cable tool rigs were more often a kind used in **California**. The "California" type had iron and steel derricks supporting heavier tools for deeper drilling. Pennsylvania-type rigs could drill to about 2,000 feet, whereas California-type rigs could drill down to 10,000 feet. Cable tool rigs were effective and relatively simple to operate, but they were slow. They averaged about 25 feet per day, depending on the type of rock.

In the 20th century, rotary drilling largely supplanted cable tool drilling. Rotary rigs eliminated the laborious bailing process and could drill faster and deeper. Rotary rigs can drill hundreds or even thousands of feet per day. Elementary rotary drilling techniques were used as far back as Egyptian times. In 1844, Robert Beard obtained a U.S. patent for a rotary drilling system with hollow drilling rods and circulating fluid to remove the cuttings. The idea underwent many improvements during the 19th century, and a rotary tool was used in **Corsicana**, **Texas**. One was also employed by **Anthony Lucas** at **Spindletop**. Initially, rotary rigs could only be used in soft rock formations. This problem was solved by the invention of the roller cone drill bit by **Howard Hughes Sr.** in 1908. The bit used 166 cutting edges distributed over the surfaces of two opposingly mounted metal cones. The bit ground the rock rather than chipping or scraping it and could be used in hard formations.

The 20th century saw many innovations in all areas of rotary drilling: collars to prevent well deviation from vertical, advances in drilling fluids, blowout prevention and control, and techniques of well cementing. The ability to control blowouts enabled deeper wells. In 1938, a depth of 15,000 feet

opened the taps and allowed all available production in **Texas**. However, there was little spare capacity left in Western countries. The first oil from **Prudhoe Bay** in **Alaska** would not be shipped until 1977. In the **North Sea**, **Ekofisk** and **Brent** had only been discovered in 1969 and 1971 and had not yet entered commercial production. **Mexico**'s **Cantarell** field would not be discovered until 1976, and the major deepwater discoveries in the U.S. **Gulf of Mexico** were still in the future. The early 1970s were thus a time of decreasing flexibility in the major Western consuming nations.

At the same time, OPEC was becoming more assertive, even before the Yom Kippur War. The **Tehran Agreement** of 1971 raised producer country profit shares. Individual OPEC countries began leapfrogging each other to gain additional concessions from the **major oil companies**. OPEC members nationalized their industries. **Algeria** expropriated 51 percent of foreign oil interests between 1968 and 1971. **Libya** began expropriation in 1971. **Iraq** completed its nationalization process in 1975. **Venezuela** had been squeezing foreign companies harder and harder for two decades and nationalized its industry in 1975–1976. Arab Gulf countries were beginning to take over their oil industries through **participation agreements**. Added to all this was a U.S. foreign policy that somewhat favored high oil prices because these helped strengthen the shah in **Iran**, seen as a major pillar of anticommunism.

This potent mix created the conditions for the First Oil Shock, which was an important turning point in the world oil market. It ended a relative stability that had existed since the end of **World War II** and undermined the Western presumption of an easy and guaranteed prosperity fueled by cheap petroleum. *See also* OIL COUNTERSHOCK; SECOND OIL SHOCK; THIRD OIL SHOCK.

FIRST OIL WELL. The question of who drilled the first modern oil well is not an easy one to answer and depends to a great extent on definitions. **Edwin Drake**'s 1859 well near **Titusville**, **Pennsylvania**, is popularly considered the first modern oil well. But there were contemporaneous and even earlier efforts elsewhere. Drake's well is most likely singled out because it had several key attributes: (1) it was drilled, not hand dug, and it was drilled deliberately to look for oil; (2) a steam engine was used to power the drill; (3) the well was cased with cast-iron pipe to prevent flooding by groundwater; and (4) the well resulted in a recognizably modern oil industry boom.

The notable earlier efforts around the world are not known to have had all these elements simultaneously. The wells drilled in **West Virginia** in 1859 just before Drake did not touch off an immediate boom of the magnitude seen in Pennsylvania. A group under Major Alexeev of the Bakinskii Corps of Mining Engineers drilled a well in the **Baku** region of **Azerbaijan** 13 years earlier than Drake—*see* VOSKOBOINIKOV, NIKOLAI (1801–C. 1861). However, their drilling equipment was not powered by an engine, and

it is unlikely that the well was cased. **Ignacy Łukasiewicz**'s oil wells in **Galicia** in the 1850s fed a refining operation and were earlier than Drake's, but they were hand dug. **James Miller Williams** was working his oil discoveries in Ontario before Drake, but he left no record of his early work. It is not clear whether his early wells were drilled or hand dug. The wells drilled at **Pechelbronn** (Alsace, France) in 1813 were not engine powered, and they were not drilled directly to obtain oil, but rather to guide an **oil sands** mining operation. Overall, Drake's well and its consequences are regarded as more prototypical of the modern industry than the earlier efforts were.

FISCHER–TROPSCH PROCESS. *See* GAS TO LIQUIDS.

FISHER, JOHN ARBUTHNOT (1841–1920). Head of the British Admiralty 1904–1910 and 1914–1915; modernizer of the Royal Navy who began the conversion of ships from coal to oil. John Arbuthnot Fisher, popularly known as Jackie, was born in Ceylon (now Sri Lanka) on 25 January 1841. Joining the British navy at age 13, he served in the Crimean War and in **China**, became a captain in 1874, and by 1892 was third sea lord and controller of the Royal Navy. In October 1904, he became first sea lord and embarked on an ambitious program of modernization. He reformed the Royal Navy's personnel systems and revised its outdated and unduly harsh disciplinary procedures. He championed electric lights, large-caliber guns, long-range gunnery, torpedo-boat destroyers, and submarines. Fisher's name is now linked inextricably with the HMS *Dreadnought*, the revolutionary prototype of the fast "all-big-gun" ship.

Fisher also began the conversion of Royal Navy ships from coal propulsion to cleaner and more efficient oil propulsion, championing the internal combustion engine. This move was to have far-reaching consequences in the oil industry and oil geopolitics, ultimately leading to the direct engagement of the British government in the oil business in **Iran**. Fisher's passion for oil propulsion earned him the nickname "Oil Maniac." When **Winston Churchill** became first lord of the Admiralty, he took up the cause of converting the navy to oil and ensuring its oil supplies with enthusiasm. Fisher had retired from the navy in 1910, but Churchill used him as an adviser and in 1912 made him head of the **Royal Commission on Fuel and Engines**, which studied the issue and further championed oil.

By 1914, Fisher was again first sea lord, under Churchill. However, he disapproved of Churchill's plan for a naval expedition through the Dardanelles, which proved to be a disaster. He resigned on 15 May 1915 in protest against Churchill's leadership of the Admiralty. He published his memoirs in 1919 and died in London on 10 July 1920.

prom. After the breakup of the Soviet Union in 1991, the Russian government moved toward privatization of state monopolies. Russian president Boris Yeltsin signed a decree on 5 November 1992 transforming Gazprom into a Russian joint stock company.

The new Gazprom was initially owned about 15 percent by workers, 28 percent by the people of Russia's gas regions, and 40 percent by the Russian government. Top managers reportedly also retained substantial shares, including Viktor Chernomyrdin, the boss of Gazprom during the Soviet era, who became Russia's prime minister in 1992. Many people were dismayed by the potentially multibillion-dollar holdings of selected top managers and decried the privatization as corrupt. In 1996, Gazprom offered 1 percent of its stock to foreign investors. In 1998 and 1999, Ruhrgas acquired 4 percent of Gazprom. In 1997, Gazprom began building the Blue Stream Pipeline across the Black Sea to Turkey, gaining **ENI** as a backer and partner in 1999. In 1999, it began building its Yamal–Europe Pipeline for gas exports to Europe.

During the Yeltsin years (until the end of 1999), the Russian government did not take a very active role in Gazprom. Under chief executive officer (CEO) Rem Vyakhirev, Gazprom did not pay significant dividends and was not particularly diligent about paying its taxes. Vyakhirev also stripped Gazprom of some valuable assets and transferred them to holding companies controlled by himself, board chairman Chernomyrdin, senior managers, and various relatives. This changed after Vladimir Putin became Russia's president in 2000. Putin replaced Chernomyrdin with an ally, Dmitri Medvedev, who would succeed Putin as Russia's president in 2008. When Vyakhirev's term as CEO of Gazprom expired in 2001, he was succeeded by Aleksei Miller, another Putin ally. Gazprom then began to pay more dividends and taxes. In 2003, the Russian government increased its stake in Gazprom to 51 percent.

Gazprom under Putin became an instrument of state power. In 2000, Gazprom called for Media-Most to sell shares to it in order to settle debts. Media-Most had shares of NTV television, which regularly criticized Putin. This led to suspicions that the Kremlin was behind the deal in an attempt to muzzle media criticism. Eventually Gazprom sold its stake in NTV. In January 2006, when Gazprom suspended gas deliveries to Ukraine, many observers believed that the Kremlin was using gas to punish the Ukrainian government for an increasingly Western orientation. There was considerable unease in the European Union (EU), which purchases large quantities of gas from Russia through pipelines traversing the Ukraine and Belarus. The Russian government could use Gazprom and its gas as a political weapon in the future. The 2011–2012 completion of Nord Stream, the North European Gas Pipeline under the Baltic linking Russia directly to Germany, further cemented EU dependence on Gazprom. In 2012 the European Union launched an antitrust investigation on Gazprom, alleging among other things that the company overcharged customers and blocked rivals. In 2017 the EU and Gazprom were still in talks to settle the case.

In 2005, Gazprom acquired a 73 percent stake in oil company Sibneft for $13 billion. Sibneft changed its name to Gazprom Neft in 2006. In 2006 Gazprom took majority control of the **Sakhalin** II project, after an agreement with Royal Dutch Shell and Japanese partners, and in 2007 acquired Siberian gas assets from **TNK–BP** (later acquired by **Rosneft**). In 2014 Gazprom signed a contract with the China National Petroleum Corporation to deliver 1.342 Tcf of gas annually to China for 30 years beginning in 2018. In 2016 Gazprom controlled oil reserves of 17.431 Bb and gas reserves of 842.419 Tcf. It produced oil and gas at the rates of 1.257 Mmbpd and 40.645 Bcfpd respectively.

GAZPROM NEFT. Formerly Sibneft; a major Russian integrated oil company now mostly owned by **Gazprom**. (Gazprom Neft should not be confused with Gazpromneft, a former Gazprom subsidiary now called Invest Union.)

Sibneft was formed in 1995 during the privatization of former Soviet industries in **Russia** under President Boris Yeltsin. Sibneft was given the state's interest in the Soviet-era oil company Noyabrskneftegaz as well as the Omsk refinery, a distribution network, and other entities. Noyabrskneftegaz was the second most northern oil producer in western **Siberia**, with a large inventory of discovered but still undeveloped fields. Russian oligarchs **Boris Berezovsky** and **Roman Abramovich** acquired a controlling interest in Sibneft beginning in 1995 for about $100 million under the **Loans for Shares** scheme. In 2000, Berezovsky sold his interest to Abramovich.

In 1998, Sibneft attempted unsuccessfully to merge with **Yukos**, a large Russian oil company controlled by oligarch **Mikhail Khodorkovsky** that owned a 20 percent stake in Sibneft. In 1999, Sibneft became the first large Russian oil company to publish audited accounts according to U.S. Generally Accepted Accounting Principles. The company announced in 2000 that it would modernize Omsk, already Russia's largest and best refinery, increasing its capacity to produce unleaded **gasoline**. In 2001, it announced plans to explore for oil in the Chukotka autonomous district, of which Abramovich was the governor. The region has a geology similar to **Alaska**'s North Slope, causing some to believe it has good oil potential. In 2002, Sibneft bought 36 percent of a Moscow refinery from **Lukoil**. In 2005, Gazprom acquired a 73 percent stake in Sibneft from Abramovich's Millhouse Capital for $13 billion. Sibneft changed its name to Gazprom Neft in 2006.