

C H A P T E R I

Oil on the Brain: The Beginning

THERE WAS THE MATTER of the missing \$526.08.

A professor's salary in the 1850s was hardly generous, and in the quest for extra income, Benjamin Silliman, Jr., the son of a great American chemist and himself a distinguished professor of chemistry at Yale University, had taken on an outside research project for a fee totaling \$526.08. He had been retained in 1854 by a group of promoters and businessmen, but, though he had completed the project, the promised fee was not forthcoming. Silliman, his ire rising, wanted to know where the money was. His anger was aimed at the leaders of the investor group, in particular, at George Bissell, a New York lawyer, and James Townsend, president of a bank in New Haven. Townsend, for his part, had sought to keep a low profile, as he feared it would look most inappropriate to his depositors if they learned he was involved in so speculative a venture.

For what Bissell, Townsend, and the other members of the group had in mind was nothing less than hubris, a grandiose vision for the future of a substance that was known as "rock oil"—so called to distinguish it from vegetable oils and animal fats. Rock oil, they knew, bubbled up in springs or seeped into salt wells in the area around Oil Creek, in the isolated wooded hills of northwestern Pennsylvania. There, in the back of beyond, a few barrels of this dark, smelly substance were gathered by primitive means—either by skimming it off the surface of springs and creeks or by wringing out rags or blankets that had been soaked in the oily waters. The bulk of this tiny supply was used to make medicine.

The group thought that the rock oil could be exploited in far larger quantities and processed into a fluid that could be burned as an illuminant in lamps. This new illuminant, they were sure, would be highly competitive with the "coal-oils" that were winning markets in the 1850s. In short, they believed that, if they could obtain it in sufficient quantities, they could bring to market the in-

expensive, high-quality illuminant that mid-nineteenth-century man so desperately needed. They were convinced that they could light up the towns and farms of North America and Europe. Almost as important, they could use rock oil to lubricate the moving parts of the dawning mechanical age. And, like all entrepreneurs who became persuaded by their own dreams, they were further convinced that by doing all of this they would grow very rich indeed. Many scoffed at them. Yet, persevering, they would succeed in laying the basis for an entirely new era in the history of mankind—the age of oil.

To “Assuage Our Woes”

The venture had its origins in a series of accidental glimpses—and in the determination of one man, George Bissell, who, more than anybody else, was responsible for the creation of the oil industry. With his long, towering face and broad forehead, Bissell conveyed an impression of intellectual force. But he was also shrewd and open to business opportunity, as experience had forced him to be. Self-supporting from the age of twelve, Bissell had worked his way through Dartmouth College by teaching and writing articles. For a time after graduation, he was a professor of Latin and Greek, then went to Washington, D.C., to work as a journalist. He finally ended up in New Orleans, where he became principal of a high school and then superintendent of public schools. In his spare time, he studied to become a lawyer and taught himself several more languages. Altogether, he became fluent in French, Spanish, and Portuguese and could read and write Hebrew, Sanskrit, ancient and modern Greek, Latin and German. Ill health forced him to head back north in 1853, and passing through western Pennsylvania on his way home, he saw something of the primitive oil-gathering industry with its skimmings and oil-soaked rags. Soon after, while visiting his mother in Hanover, New Hampshire, he dropped in on his alma mater, Dartmouth College, where in a professor's office he spied a bottle containing a sample of this same Pennsylvania rock oil. It had been brought there a few weeks earlier by another Dartmouth graduate, a physician practicing as a country doctor in western Pennsylvania.

Bissell knew that amounts of rock oil were being used as patent and folk medicines to relieve everything from headaches, toothaches, and deafness to stomach upsets, worms, rheumatism, and dropsy—and to heal wounds on the backs of horses and mules. It was called “Seneca Oil” after the local Indians and in honor of their chief, Red Jacket, who had supposedly imparted its healing secrets to the white man. One purveyor of Seneca Oil advertised its “wonderful curative powers” in a poem:

The Healthful balm, from Nature's secret spring,
The bloom of health, and life, to man will bring;
As from her depths the magic liquid flows,
To calm our sufferings, and assuage our woes.

Bissell knew that the viscous black liquid was flammable. Seeing the rock oil sample at Dartmouth, he conceived, in a flash, that it could be used not as a

medicine but as an illuminant—and that it might well assuage the woes of his pocketbook. He could put the specter of poverty behind him and become rich from promoting it. That intuition would become his guiding principle and his faith, both of which would be sorely tested during the next six years, as disappointment consistently overwhelmed hope.¹

The Disappearing Professor

But could the rock oil really be used as an illuminant? Bissell aroused the interest of other investors, and in late 1854 the group engaged Yale's Professor Silliman to analyze the properties of the oil both as an illuminant and lubricant. Perhaps even more important, they wanted Silliman to put his distinguished imprimatur on the project so they could sell stock and raise the capital to carry on. They could not have chosen a better man for their purposes. Heavystet and vigorous, with a “good, jolly face,” Silliman carried one of the greatest and most respected names in nineteenth-century science. The son of the founder of American chemistry, he himself was one of the most distinguished scientists of his time, as well as the author of the leading textbooks in physics and chemistry. Yale was the scientific capital of mid-nineteenth-century America, and the Sillimans, father and son, were at the center of it.

But Silliman was less interested in the abstract than in the decidedly practical, which drew him to the world of business. Moreover, while reputation and pure science were grand, Silliman was perennially in need of supplementary income. Academic salaries were low and he had a growing family; so he habitually took on outside consulting jobs, making geological and chemical evaluations for a variety of clients. His taste for the practical would also carry him into direct participation in speculative business ventures, the success of which, he explained, would give him “plenty of sea room . . . for science.” A brother-in-law was more skeptical. Benjamin Silliman, Jr., he said, “is on the constant go in behalf of one thing or another, and alas for Science.”

When Silliman undertook his analysis of rock oil, he gave his new clients good reason to think they would get the report they wanted. “I can promise you,” he declared early in his research, “that the result will meet your expectations of the value of this material.” Three months later, nearing the end of his research, he was even more enthusiastic, reporting “unexpected success in the use of the distillate product of *Rock Oil* as an illuminator.” The investors waited eagerly for the final report. But then came the big hitch. They owed Silliman the \$526.08 (the equivalent of about \$5,000 today), and he had insisted that they deposit \$100 as a down payment into his account in New York City. Silliman's bill was much higher than they had expected. They had not made the deposit, and the professor was upset and angry. After all, he had not taken on the project merely out of intellectual curiosity. He needed the money, badly, and he wanted it soon. He made it very clear that he would withhold the study until he was paid. Indeed, to drive home his complaint, he secretly handed over the report to a friend for safe-keeping until satisfactory arrangements were made, and took himself off on a tour of the South, where he could not easily be reached.

The investors grew desperate. The final report was absolutely essential if

they were to attract additional capital. They scrounged around, trying to find the money, but with no success. Finally, one of Bissell's partners, though complaining that "these are the hardest times I ever heard of," put up the money on his own security. The report, dated April 16, 1855, was released to the investors and hurried to the printers. Though still appalled by Silliman's fee, the investors, in fact, got more than their money's worth. Silliman's study, as one historian put it, was nothing less than "a turning point in the establishment of the petroleum business." Silliman banished any doubts about the potential new uses for rock oil. He reported to his clients that it could be brought to various levels of boiling and thus distilled into several fractions, all composed of carbon and hydrogen. One of these fractions was a very high-quality illuminating oil. "Gentlemen," Silliman wrote to his clients, "it appears to me that there is much ground for encouragement in the belief that your Company have in their possession a raw material from which, by simple and not expensive processes, they may manufacture very valuable products." And, satisfied with the business relationship as it had finally been resolved, he held himself fully available to take on further projects.

Armed with Silliman's report, which proved a most persuasive advertisement for the enterprise, the group had no trouble raising the necessary funds from other investors. Silliman himself took two hundred shares, adding further to the respectability of the enterprise, which became known as the Pennsylvania Rock Oil Company. But it took another year and a half of difficulties before the investors were ready to take the next hazardous step.

They now knew, as a result of Silliman's study, that an acceptable illuminating fluid could be extracted from rock oil. But was there enough rock oil available? Some said that it was only the "drippings" from underground coal seams. Certainly, a business could not be built from skimming oil stains off the surfaces of creeks or from wringing out oil-soaked rags. The critical issue, and what their enterprise was all about, was proving that there was a sufficient and obtainable supply of rock oil to make for a substantial paying proposition.²

Price and Innovation

The hopes pinned on the still mysterious properties of oil arose from pure necessity. Burgeoning populations and the spreading economic development of the industrial revolution had increased the demand for artificial illumination beyond the simple wick dipped into some animal grease or vegetable fat, which was the best that most could afford over the ages, if they could afford anything at all. For those who had money, oil from the sperm whale had for hundreds of years set the standard for high-quality illumination; but even as demand was growing, the whale schools of the Atlantic had been decimated, and whaling ships were forced to sail farther and farther afield, around Cape Horn and into the distant reaches of the Pacific. For the whalers, it was the golden age, as prices were rising, but it was not the golden age for their consumers, who did not want to pay \$2.50 a gallon—a price that seemed sure to go even higher. Cheaper lighting fluids had been developed. Alas, all of them were inferior. The most popular was camphene, a derivative of turpentine, which produced a good light but had the

unfortunate drawback of being highly flammable, compounded by an even more unattractive tendency to explode in people's houses. There was also "town gas," distilled from coal, which was piped into street lamps and into the homes of an increasing number of middle- and upper-class families in urban areas. But "town gas" was expensive, and there was a sharply growing need for a reliable, relatively cheap illuminant. There was that second need as well—lubrication. The advances in mechanical production had led to such machines as power looms and the steam printing press, which created too much friction for such common lubricants as lard.

Entrepreneurial innovation had already begun to respond to these needs in the late 1840s and early 1850s, with the extraction of illuminating and lubricating oils from coal and other hydrocarbons. A lively cast of characters, both in Britain and in North America, carried the search forward, defining the market and developing the refining technology on which the oil industry would later be based. A court-martialed British admiral, Thomas Cochrane—who, it was said, provided the model for Lord Byron's *Don Juan*—became obsessed with the potential of asphalt, sought to promote it, and, along the way, acquired ownership of a huge tar pit in Trinidad. Cochrane collaborated for a time with a Canadian, Dr. Abraham Gesner. As a young man, Gesner had attempted to start a business exporting horses to the West Indies, but, after being shipwrecked twice, gave it up and went off to Guy's Hospital in London to study medicine. Returning to Canada, he changed careers yet again and became provincial geologist for New Brunswick. He developed a process for extracting an oil from asphalt or similar substances and refining it into a quality illuminating oil. He called this oil "kerosene"—from *Keros* and *elaion*, the Greek words, respectively, for "wax" and "oil," altering the *elaion* to *ene*, so that his product would sound more like the familiar camphene. In 1854 he applied for a United States patent for the manufacture of "a new liquid hydrocarbon, which I denominate Kerosene, and which may be used for illuminating or other purposes."

Gesner helped establish a kerosene works in New York City that by 1859 was producing five thousand gallons a day. A similar establishment was at work in Boston. The Scottish chemist James Young had pioneered a parallel refining industry in Britain, based on cannel coal, and one also developed in France, using shale rock. By 1859, an estimated thirty-four companies in the United States were producing \$5 million a year worth of kerosene or "coal-oils," as the product was generically known. The growth of this coal-oil business, wrote the editor of a trade journal, was proof of "the impetuous energy with which the American mind takes up any branch of industry that promises to pay well." A small fraction of the kerosene was extracted from Pennsylvania rock oil that was gathered by the traditional methods and that would, from time to time, turn up at the refineries in New York.³

Oil was hardly unfamiliar to mankind. In various parts of the Middle East, a semisolid oozy substance called bitumen seeped to the surface through cracks and fissures, and such seepages had been tapped far back into antiquity—in Mesopotamia, back to 3000 B.C. The most famous source was at Hit, on the Euphrates, not far from Babylon (and the site of modern Baghdad). In the first century B.C., the Greek historian Diodor wrote enthusiastically about the ancient

bitumen industry: "Whereas many incredible miracles occur in the Babylonian country, there is none such as the great quantity of asphalt found there." Some of these seepages, along with escaping petroleum gases, burned continuously, providing the basis for fire worship in the Middle East.

Bitumen was a traded commodity in the ancient Middle East. It was used as a building mortar. It bound the walls of both Jericho and Babylon. Noah's ark and Moses' basket were probably caulked, in the manner of the time, with bitumen to make them waterproof. It was also used for road making and, in a limited and generally unsatisfactory way, for lighting. And bitumen served as a medicine. The description by the Roman naturalist Pliny in the first century A.D. of its pharmaceutical value was similar to that current in the United States during the 1850s. It checked bleeding, Pliny said, healed wounds, treated cataracts, provided a liniment for gout, cured aching teeth, soothed a chronic cough, relieved shortness of breath, stopped diarrhea, drew together severed muscles, and relieved both rheumatism and fever. It was also "useful for straightening out eyelashes which inconvenience the eyes."

There was yet another use for oil; the product of the seepages, set afire, found an extensive and sometimes decisive role in warfare. In the *Iliad*, Homer recorded that "the Trojans cast upon the swift ship unwearyed fire, and over her forthwith streamed a flame that might not be quenched." When the Persian King Cyrus was preparing to take Babylon, he was warned of the danger of street fighting. He responded by talking of setting fires, and declared, "We also have plenty of pitch and tow, which will quickly spread the flames everywhere, so that those upon the house-tops must either quickly leave their posts or quickly be consumed." From the seventh century onward, the Byzantines had made use of *oleum incendiарium*—Greek fire. It was a mixture of petroleum and lime that, touched with moisture, would catch fire; the recipe was a closely guarded state secret. The Byzantines heaved it on attacking ships, shot it on the tips of arrows, and hurled it in primitive grenades. For centuries, it was considered a more terrible weapon than gunpowder.⁴

So the use of petroleum had a long and varied history in the Middle East. Yet, in a great mystery, knowledge of its application was lost to the West for many centuries, perhaps because the known major sources of bitumen, and the knowledge of its uses, lay beyond the boundaries of the Roman empire, and there was no direct transition of that knowledge to the West. Even so, in many parts of Europe—Bavaria, Sicily, the Po Valley, Alsace, Hannover, and Galicia, to name a few—oil seepages were observed and commented upon from the Middle Ages onward. And refining technology was transmitted to Europe via the Arabs. But, for the most part, petroleum was put to use only as the all-purpose medicinal remedy, fortified by learned disquisitions on its healing properties by monks and early doctors. But, well before George Bissell's entrepreneurial vision and Benjamin Silliman's report, a small oil industry had developed in Eastern Europe—first in Galicia (which was variously part of Poland, Austria, and Russia) and then in Rumania. Peasants dug shafts by hand to obtain crude oil, from which kerosene was refined. A pharmacist from Lvov, with the help of a plumber, invented a cheap lamp suited to burning kerosene. By 1854, kerosene was a staple of commerce in Vienna. By 1859, Galicia had a thriving kerosene

oil business, with over 150 villages involved in oil mining, led by such families as Backenroth-Bronicki. Altogether, European crude production in 1859 had been estimated at thirty-six thousand barrels, primarily from Galicia and Rumania. What the Eastern European industry lacked, more than anything else, was the technology for drilling.

In the 1850s, the spread of kerosene in the United States faced two significant barriers: There was as yet no substantial source of supply, and there was no cheap lamp well-suited to burning what kerosene was available. The lamps that did exist tended to become smoky, and the burning kerosene gave off an acrid smell. Then a kerosene sales agent in New York learned that a lamp with a glass chimney was being produced in Vienna to burn Galician kerosene. Based upon the design of the pharmacist and the plumber in Lvov, the lamp overcame the problems of the smoke and the smell. The New York salesman started to import the lamp, which quickly found a market. Though its design was subsequently improved many times over, that Vienna lamp became the basis of the kerosene lamp trade in the United States and was later re-exported around the world.⁵

Thus by the time that Bissell was launching his venture, a cheaper quality illuminating oil—kerosene—had already been introduced into some homes. The techniques required for refining petroleum into kerosene had already been commercialized with coal-oils. And an inexpensive lamp had been developed that could satisfactorily burn kerosene. In essence, what Bissell and his fellow investors in the Pennsylvania Rock Oil Company were trying to do was discover a new source for the raw material that went into an existing, established process. It all came down to price. If they could find rock oil—petroleum—in sufficient abundance, it could be sold cheaply, capturing the illuminating oils market from products that were either far more expensive or far less satisfactory.

Digging for oil would not do it. But perhaps there was an alternative. Salt "boring," or drilling, had been developed more than fifteen hundred years earlier in China, with wells going down as deep as three thousand feet. Around 1830, the Chinese method was imported into Europe and copied. That, in turn, may have stimulated the drilling of salt wells in the United States. George Bissell was still struggling to put his venture together when, on a hot day in New York in 1856, he took refuge from the burning sun under the awning of a druggist's shop on Broadway. There in the window, he caught sight of an advertisement for a rock oil medicine that showed several drilling derricks—of the kind used to bore for salt. The rock oil for the patent medicine was obtained as a byproduct of drilling for salt. With that coincidental glimpse by Bissell—following on his earlier ones in western Pennsylvania and at Dartmouth College—the last piece fell into place in his mind. Could not that technique of drilling be applied to the recovery of oil? If the answer was yes, here at last was the means for achieving his fortune.

The essential insight of Bissell—and then of his fellow investors in the Pennsylvania Rock Oil Company—was to adapt the salt-boring technique directly to oil. Instead of digging for rock oil, they would drill for it. They were not alone; others in the United States and Ontario, Canada, were experimenting with the same idea. But Bissell and his group were ready to move. They had Professor Silliman's report, and because of the report they had the capital. Still, they

were not taken very seriously. When the banker James Townsend discussed their idea of drilling, many in New Haven derided it: "Oh Townsend, oil coming out of the ground, pumping oil out of the earth as you pump water? Nonsense! You're crazy." But the investors were intent on going ahead. They were convinced of the need and the opportunity. But to whom would they now entrust this lunatic project?"

The "Colonel"

Their candidate was one Edwin L. Drake, who was chosen mainly by coincidence. He certainly brought no outstanding or obvious qualifications to the task. He was a jack-of-all-trades and a sometime railroad conductor, who had been laid up by bad health and was living with his daughter in the old Tontine Hotel in New Haven. By chance, James Townsend, the New Haven banker, lived in the same hotel. It was the sort of hotel where men gathered to exchange news and shoot the breeze, a perfect setting for the thirty-eight-year-old Drake, who was friendly, jovial, and loquacious, and had nothing else to do. So he would pass the evenings entertaining his companions with stories drawn from his varied life. He had a vivid imagination, and his stories tended to be dramatic, exaggerated tales, in all of which Drake himself played a central, heroic role. He and Townsend talked frequently about the rock oil venture. Townsend even persuaded Drake to buy some stock in the company. Townsend then recruited Drake himself to the scheme. He was out of work and thus available, and since he was on leave as a conductor, he had a railroad pass and could travel for free, which was most helpful to the financially pinched speculative venture. He had another attribute that would be of great value: He could be very tenacious.

Dispatching Drake to Pennsylvania, Townsend gave him what turned out to be a valuable send-off. Concerned about the frontier conditions and the need to impress the "backwoodsmen," the banker sent ahead several letters addressed to "Colonel" E. L. Drake. Thus was "Colonel" Drake invented, though a "colonel" he certainly was not. The stratagem worked. For a warm and hospitable welcome was received by "Colonel" E. L. Drake, when, in December of 1857, he arrived, after an exhausting journey through a sea of mud, on the back of the twice-weekly mail wagon, in the tiny, impoverished village of Titusville, population 125, tucked into the hills of northwestern Pennsylvania. Titusville was a lumber town, whose inhabitants were deeply in debt to the local lumber company's store. It was generally expected that the village would die when the surrounding hills had all been logged and that the site would then be reclaimed by the wild.

Drake's first job was simply to perfect the title to the prospective oil land, which was on a farm. This he quickly accomplished. He returned to New Haven, intent on the much more daunting next step, drilling for oil. "I had made up my mind," he later said, that oil "could be obtained in large quantities by Boreing as for Salt Water. I also determined that I should be the one to do it. But I found that no one with whom I conversed upon the subject agreed with me, all maintaining that oil was the drippings of an extensive Coal field or bed."

But Drake was not to be dissuaded or diverted. He was back in Titusville in the spring of 1858 to commence work. The investors had established a new com-

pany, the Seneca Oil Company, with Drake as its general agent. He set up operations about two miles down Oil Creek from Titusville, on a farm that contained an oil spring, from which three to six gallons of oil a day were collected by the traditional methods. After several months back in Titusville, he wrote Townsend, "I shall not try to dig by hand any more, as I am satisfied that boring is the cheapest." But he begged the New Haven banker to send additional funds immediately. "Money we must have if we are to make anything. . . . Please let me know at once. Money is very scarce here." After some delay, Townsend managed to send a thousand dollars, and with it Drake tried to hire the "salt borers"—or drillers—that he needed if he were to proceed. But salt drillers had a reputation for extreme partiality to whiskey and frequent drunkenness, and he wanted to be very careful whom he hired. So he would tie compensation to successful completion at the rate of one dollar per foot drilled. The first couple of drillers he engaged simply disappeared or begged off. In truth, though they dared not tell Drake so to his face, they thought he was insane. Drake knew only that he had nothing to show for his first year in Titusville, and the bleak winter was at hand. So he devoted himself to erecting the steam engine that would power the drill bit, while the investors back in New Haven fretted and waited.

Finally, in the spring of 1859, Drake found his driller, a blacksmith named William A. Smith—"Uncle Billy" Smith—who came with his two sons. Smith knew something about what needed to be done, for he made the tools for the salt water drillers, and the little team now proceeded to build the derrick and assemble the necessary equipment. They assumed they would have to go several hundred feet into the earth. The work was slow, and the investors in New Haven were becoming more and more restive at the lack of progress. Still, Drake stuck to his plan. He would not give up. Eventually, Townsend was the only one of the promoters who still believed in the project, and, when the venture ran out of money, he began paying the bills out of his own pocket. In despair, he at last sent Drake a money order as a final remittance and instructed him to pay his bills, close up the operation, and return to New Haven. That was toward the end of August 1859.

Drake had not yet received the letter when, on Saturday afternoon, August 27, 1859, at sixty-nine feet, the drill dropped into a crevice and then slid another six inches. Work was called off for the rest of the weekend. The next day, Sunday, Uncle Billy came out to see the well. He peered down into the pipe. He saw a dark fluid floating on top of the water. He used a tin rain spout to draw up a sample. As he examined the heavy liquid, he was overcome by excitement. On Monday, when Drake arrived, he found Uncle Billy and his boys standing guard over tubs, washbasins, and barrels, all of which were filled with oil. Drake attached a common hand pump and began to do exactly what the scoffers had ridiculed—pump up the liquid. That same day he received the money order from Townsend and the command to close up shop. A week earlier, with the last of the funds in hand, he would have done so. But not anymore. Drake's single-mindedness had paid off. Just in time. He had hit oil. Farmers along Oil Creek rushed into Titusville shouting, "The Yankee has struck oil." The news spread like wildfire and started a mad rush to acquire sites and drill for oil. The population of tiny Titusville multiplied overnight, and land prices shot up instantaneously.

Success with the drill did not, however, guarantee financial success. It meant new problems. What were Drake and Uncle Billy to do with the flow of oil? They got hold of every whiskey barrel they could scrounge in the area, and when all the barrels were filled, they built and filled several wooden vats. Unfortunately, one night the flame from a lantern ignited the petroleum gases, causing the entire storage area to explode and go up in fierce flames. Meanwhile, other wells were drilled in the neighborhood, and more rock oil became available. Supply far outran demand, and the price plummeted. With the advent of drilling, there was no shortage of rock oil. The only shortage now was of whiskey barrels, and they soon cost almost twice as much as the oil inside them.⁷

"The Light of the Age"

It did not take long for Pennsylvania rock oil to find its way to market refined as kerosene. Its virtues were immediately clear. "As an illuminator the oil is without a figure: It is the light of the age," wrote the author of America's very first handbook on oil, less than a year after Drake's discovery. "Those that have not seen it burn, may rest assured its light is no moonshine; but something nearer the clear, strong, brilliant light of day, to which darkness is no party . . . rock oil emits a dainty light; the brightest and yet the cheapest in the world; a light fit for Kings and Royalists and not unsuitable for Republicans and Democrats."

George Bissell, the original promoter, was among those who had wasted no time in getting to Titusville. He spent hundreds of thousands of dollars frantically leasing and buying farms in the vicinity of Oil Creek. "We find here an unparalleled excitement," he wrote to his wife. "The whole population are crazy almost . . . I never saw such excitement. The whole western country are thronging here and fabulous prices are offered for lands in the vicinity where there is a prospect of getting oil." It had taken Bissell six years to get to this point, and the ups and downs of his journey gave him reason to reflect. "I am quite well, but very much worn down. We have had a hard time of it, very. Our prospects are most brilliant that's certain. . . . We ought to make an immense fortune."

Bissell did indeed become very wealthy. And, among his many philanthropies, he donated the money for a gymnasium to Dartmouth, where first he had seen the bottle of rock oil that inspired his vision. He insisted that the gym be equipped with six bowling alleys "in remembrance of disciplinary troubles into which he had fallen as an undergraduate because of his indulgence in this sinful sport." It was said of Bissell in his later years "that his name and fame is a 'household word' among oil men from end to end of the continent." James Townsend, the banker who had taken the greatest financial risk, was denied the credit he thought he deserved. "The whole plan was suggested by me, and my suggestions were carried out," he later wrote bitterly. "The raising of the money and sending it out was done by me. I do not say it egotistically, but only as a matter of truth, that if I had not done what I did in favor of developing Petroleum it would not have been developed at that time." Yet he added, "the suffering and anxiety I experienced I would not repeat for a fortune."

As for Drake, things did not go well at all. He became an oil buyer, then a partner in a Wall Street firm specializing in oil shares. He was improvident, not

a good businessman, indeed a gambler of sorts when it came to commerce. By 1866, he had lost all his money, then became a semi-invalid, racked with pain, living in poverty. "If you have any of the milk of human kindness left in your bosom for me or my family, send me some money," he wrote to one friend. "I am in want of it sadly and am sick." Finally, in 1873, the state of Pennsylvania granted him a small lifetime pension for his service, bringing him some measure of relief in his final years from his financial difficulties, if not his physical pain.

Toward the end of his life, Drake sought to stake out his place in history. "I claim that I did invent the driving Pipe and drive it and without that they could not bore on bottom lands when the earth is full of water. And I claim to have bored the first well that ever was bored for Petroleum in America and can show the well." He was emphatic. "If I had not done it, it would have not been done to this day."⁸

The First Boom

Indeed, all the other elements—refining, experience with kerosene, and the right kind of lamp—were in place when Drake proved, through drilling, the final requirement for a new industry, the availability of supply. And with that, man was suddenly given the ability to push back the night. Yet that was only the beginning. For Drake's discovery would, in due course, bequeath mobility and power to the world's population, play a central role in the rise and fall of nations and empires, and become a major element in the transformation of human society. But all that, of course, was still to come.

What followed immediately was like a gold rush. The flats in the narrow valley of Oil Creek were quickly leased, and by November of 1860, fifteen months after Drake's discovery, about seventy-five wells were producing, with many more dry holes scarring the earth. Titusville "is now the rendezvous of strangers eager for speculation," a writer had already observed by 1860. "They barter prices in claims and shares; buy and sell sites, and report the depth, show, or yield of wells, etc. etc. Those who leave today tell others of the well they saw yielding 50 barrels of pure oil a day. . . . The story sends more back tomorrow. . . . Never was a hive of bees in time of swarming more astir, or making a greater buzz."

Down at the bottom of Oil Creek, where it flowed into the Allegheny River, a small town called Cornplanter, named after a Seneca Indian chief, was renamed Oil City and became the major center, along with Titusville, for the area now known as the Oil Regions. Refineries to turn the crude into kerosene were cheap to build, and by 1860, at least fifteen were operating in the Oil Regions, with another five in Pittsburgh. A coal-oil refiner visited the oil fields in 1860 to see the competition for himself. "If this business succeeds," he said, "mine is ruined." He was right; by the end of 1860, the coal-oil refiners either were out of business or had moved quickly to turn themselves into crude-oil refiners.

Yet all the wells thus far were modest producers and had to be pumped. That changed in April 1861, when drillers struck the first flowing well, which gushed at the astonishing rate of three thousand barrels per day. When the oil from that well shot into the air, something ignited the escaping gases, setting off a great

explosion and creating a wall of fire that killed nineteen people and blazed on for three days. Though temporarily lost in the thunderous news of the week before—that the South had fired on Fort Sumter, the opening shots of the Civil War—the explosion announced to the world that ample supplies for the new industry would be available.

Production in western Pennsylvania rose rapidly—from about 450,000 barrels in 1860 to 3 million barrels in 1862. The market could not develop quickly enough to match the swelling volume of oil. Prices, which had been \$10 a barrel in January 1861, fell to 50 cents by June and, by the end of 1861, were down to 10 cents. Many producers were ruined. But those cheap prices gave Pennsylvania oil a quick and decisive victory in the marketplace, swiftly capturing consumers and driving out coal-oils and other illuminants. Demand soon caught up with available supply, however, and by the end of 1862 prices rose to \$4 a barrel and then, by September 1863, to as high as \$7.25 a barrel. Despite the wild fluctuation of prices, the stories of instant wealth continued to draw the throngs to the Oil Regions. In less than two years one memorable well generated \$15,000 of profit for every dollar invested.⁹

The Civil War hardly disrupted the frantic boom in the Oil Regions; on the contrary, it actually gave a major stimulus to the development of the business. For the war cut off the shipment of turpentine from the South, creating an acute shortage of camphene, the cheap illuminating oil derived from turpentine. Kerosene made from Pennsylvania oil quickly filled the gap, developing markets in the North much more quickly than might otherwise have been the case. The war had an even more significant impact. When the South seceded, the North no longer benefited from the foreign revenues from cotton, one of America's major exports. The rapid growth of oil exports to Europe helped compensate for that loss and provided a significant new source of foreign earnings.

The end of the war, with all its turbulence and dislocations, released thousands and thousands of veterans who poured into the Oil Regions to start their lives again and seek their fortunes in a new speculative boom that was fueled by the incentive of prices, which rose as high as \$13.75 a barrel. The effects of the frenzy were felt up and down the East Coast, as hundreds of new oil companies were floated. Office space for those new companies ran short in the financial district of New York, and shares were sold so rapidly that one new company disposed of its entire issue in just four hours. A British banker was amazed by the “hundreds of thousands of provident working men, who prefer the profits of petroleum to the small rates of interest afforded by savings banks.” Washington, D.C., was no more immune to the craze than New York. Congressman James Garfield, who became a substantial investor in oil lands—and, later, President of the United States—reported to an oil-lease salesman that he had discussed oil with a number of other members of Congress, “who are in the business, for you must know the fever has assailed Congress in no mild form.”¹⁰

Nothing revealed the feverish pitch of speculation better than the strange story of the town of Pithole, on Pithole Creek, some fifteen miles from Titusville. A first well was struck in the dense forest land there in January 1865; by June, there were four flowing wells, producing two thousand barrels per day—one third of the total output of the Oil Regions—and people fought their way in

on the roads already clogged with the barrel-laden wagons. “The whole place,” said one visitor, “smells like a corps of soldiers when they have the diarrhoea.” The land speculation seemed to know no bounds. One farm that had been virtually worthless a few months earlier was sold for \$1.3 million in July 1865, and then resold for two million dollars in September. In that same month, production around Pithole Creek reached six thousand barrels per day—two-thirds of all the production in the Oil Regions. And, by that same September, what had once been an unidentifiable spot in the wilderness had become a town of fifteen thousand people. The *New York Herald* reported that the principal businesses of Pithole were “liquor and leases”; and *The Nation* added, “It is safe to assert that there is more vile liquor drunk in this town than in any of its size in the world.” Yet Pithole was already on the road to respectability, with two banks, two telegraph offices, a newspaper, a waterworks, a fire company, scores of boarding houses and businesses, more than fifty hotels—at least three of which were up to elegant metropolitan standards—and a post office that handled more than five thousand letters a day.

But then, a couple of months later, the oil production abruptly gave out—just as quickly as it had begun. To the people of Pithole, this was a calamity, like a biblical plague, and by January 1866, only a year from the first discovery, thousands had fled the town for new hopes and opportunities. The town that had sprung up overnight from the wilderness was totally deserted. Fires ravaged the buildings, and the wooden skeletons that were left were torn down to be used for building again elsewhere or burned as kindling by the farmers in the surrounding hills. Pithole returned to silence and to the wilderness. A parcel of land in Pithole that sold for \$2 million in 1865 was auctioned for \$4.37 in 1878.

Even as Pithole died, the speculative boom was exploding elsewhere and engulfing neighboring areas. Production in the Oil Regions jumped to 3.6 million barrels in 1866. The enthusiasm for oil seemed to know no limits, and it became not only a source of illumination and lubrication, but also part of the popular culture. Americans danced to the “American Petroleum Polka” and the “Oil Fever Gallop,” and they sang such songs as “Famous Oil Firms” and “Oil on the Brain.”

There's various kind of oil afloat, Cod-liver, Castor, Sweet;
Which tend to make a sick man *well*, and set him on his *feet*.
But our's a curious *feat* performs: We just a *well obtain*,
And set the people crazy with “Oil on the brain.”

There's neighbor Smith, a poor young man, Who couldn't raise a dime;
Had clothes which boasted many rents. And took his “nip” on time.
But now he's clad in dandy style, Sports diamonds, kids, and cane;
And his success was owing to “Oil on the brain.”¹¹

Boom and Bust

The race to find the oil was swiftly followed by another race to produce it as quickly and in as much volume as possible. The drive for “flush production”

often damaged the reservoirs, leading to premature exhaustion of gas pressure, and thus far less recovery than would otherwise have been the case. Yet there were several reasons why this became the standard practice. One was the lack of geological knowledge. Another was the large and quick rewards that were to be attained. A third was the nature of leasing terms, which put a premium on producing as quickly as possible.

But, most important in shaping the legal context of American oil production, and the very structure of the industry from the earliest days, was the "rule of capture," a doctrine based on English common law. If a game animal or bird from one estate migrated to another, the owner of the latter estate was perfectly within his rights to kill the game on his land. Similarly, owners of land had the right to draw out whatever wealth lay beneath it; for, as one English judge had ruled, no one could be sure of what was actually going on "through these hidden veins of the earth."

As applied to oil production, the rule of capture meant that the various surface owners atop a common pool could take all the oil they could get, even if they disproportionately drained the pool or reduced the output of nearby wells and neighboring producers. Inevitably, therefore, the owners of adjacent wells were in heated competition to produce as much as they could as swiftly as possible, to avoid having the pool drained by another. The impetus to rapid production contributed to the instability of both production and prices. Oil was not the same as game birds, and the rule of capture led to considerable waste and damage, to the detriment of ultimate production from a given pool. But there was another side to the rule's effects. It created room for many more people to enter the industry and to master the required skills than would have been the case under more restrictive rules. And, by building up production more quickly, it also helped to make possible a wider market.¹²

Fueled by the rule of capture—and the race for riches—the wild drive to produce created in the Oil Regions a chaotic scene of heaving populations, of shacks and quick-built wooden buildings, of hotels with four or five or six straw mattresses crowded into a single room, of derricks and storage tanks, with everyone energized by hope and rumor and the acrid scent of oil. And, everywhere, there was one inescapable factor—the perennial mud. "Oil Creek mud attained a fame in the earlier and subsequent years, that will ever be fresh in the memory of those who saw and were compelled to wade through it," two writers observed at the time. "Mud, deep, and indescribably disgusting, covered all the main and by-roads in wet weather, while the streets of the towns composing the chief shipping points, had the appearance of liquid lakes or lanes of mud."

There were some who looked at all the boom and hustle, and at the "sharers" who came for the quick dollar, and remembered the quiet Pennsylvania hills and villages before oil burst on the scene. They asked what had happened and marveled that human nature could be so transformed—and debased—by the specter of riches. "The oil and land excitement in this section has already become a sort of epidemic," wrote a local editor in 1865. "It embraces all classes and ages and conditions of men. They neither talk, nor look, nor act as they did six months ago. Land, leases, contracts, refusals, deeds, agreements, interests, and all that sort of talk is all they can comprehend.

Strange faces meet us at every turn, and half our inhabitants can be more readily found in New York or Philadelphia than at home. . . . The court is at a standstill; the bar is demoralized; the social circle is broken; the sanctuary is forsaken; and all our habits, and notions, and associations for half a century are turned topsy-turvy in the headlong rush for riches. Some poor men become rich; some rich men become richer; some poor men and some rich men lose all they invest. So we go."

The editor had a final thought. "The big bubble will burst sooner or later."¹³

The bubble did burst—the inevitable reaction to the speculation and frantic overproduction. Depression engulfed the industry in 1866 and 1867; the price of oil dropped as low as \$2.40 a barrel. Yet, while many stopped drilling, some did not, and new fields were opened up beyond Oil Creek. Moreover, innovation and organization were being imposed upon the industry.

From the first discoveries, teamsters, lashing their horses, had clogged the roads of the Oil Regions with their loads of barrels. They were more than just a physical bottleneck. Holding a monopoly position, they charged exorbitant rates; it cost more to move a barrel over a few miles of muddy road to a railway stop than to transport it by rail from western Pennsylvania all the way to New York. The teamsters' stranglehold on transportation led to an ingenious effort to develop an alternative—transportation by pipeline. Between 1863 and 1865, despite much scoffing and public ridicule, wooden pipelines proved that they could carry oil much more efficiently and cheaply. The teamsters, seeing their position challenged, responded with threats, armed attacks, arson, and sabotage. But it was too late. By 1866, pipelines were hooked up to most of the wells in the Oil Regions, feeding into a larger pipeline gathering system that connected with the railroads.

The refiners needed to acquire oil and that, too, was chaotic. Purchasing of oil had first been done on a hit-or-miss basis by buyers on horseback, riding from well to well. But, as the industry grew, a more orderly marketing system emerged. Informal oil exchanges, where buyers and sellers could meet and agree on prices, developed in a hotel in Titusville and at a curbside exchange, near the railway tracks, in Oil City. Beginning in the early 1870s, more formal oil exchanges emerged in Titusville, in Oil City, elsewhere in the Oil Regions, and in New York. Oil was bought and sold on three bases. "Spot" sales called for immediate delivery and payment. A "regular" sale required the transaction to be completed within ten days. And the sale of "futures" established that a certain quantity would be sold at a certain price within a specified time in the future. The futures prices were the focus for speculation, and oil became "the favorite speculative commodity of the time." The buyer was bound either to take the oil and pay the contracted price—or to pay or receive the difference between the contracted price and the "regular" price at the time of settlement. Thus, buyers could make a handsome profit—or suffer a devastating loss—without even taking possession of the oil.

By the time the Titusville Oil Exchange opened in 1871, oil was already on its way to becoming a very big business, one that would transform the everyday lives of millions. Altogether, the decade of the 1860s had been one of dizzy ad-

vance from Drake's lunatic experiment. Here was truly the lasting proof of "the impetuous energy with which the American mind takes up any branch of industry that promises to pay well." George Bissell's intuition and Edwin Drake's discovery and the perseverance of both these men had opened a turbulent era—a time of ingenuity and innovation, of deals and frauds, of fortunes made, fortunes lost, fortunes never made, of grueling hard work and bitter disappointments, and of astonishing growth.¹⁴

And what might be expected of oil's future? There were those who looked at what had happened so quickly in western Pennsylvania and saw much greater opportunities ahead. They envisioned the industry on a scale that few in the Oil Regions could begin to imagine, and yet at the same time they were also repelled and disgusted by the chaos and disorder, the fluctuations and the frenzy. They had their own very strong ideas about how the oil business ought to be organized and proceed. And they were already at work, according to their own plans.

CHAPTER 2

"Our Plan": John D. Rockefeller and the Combination of American Oil

A CURIOUS AUCTION took place one February day in 1865 in Cleveland, Ohio, then a bustling city that had profited from both the Civil War and the oil boom and now stood to prosper from the great era of America's industrial expansion. The two senior partners in one of the city's most successful oil refineries had fallen into yet another of their chronic disputes over the speed of expansion. Maurice Clark, the more cautious partner, threatened dissolution. This time, the other partner, John D. Rockefeller, surprised him by accepting. The two men subsequently agreed that a private auction should be held between the two of them, the highest bidder to get the company; and they decided to hold the auction immediately, right there in the office.

The bidding began at \$500, but climbed quickly. Maurice Clark was soon at \$72,000. Rockefeller calmly went to \$72,500. Clark threw up his hands. "I'll go no higher, John," he said. "The business is yours." Rockefeller offered to write out a check on the spot; Clark told him, no, he could settle at his convenience. On a handshake they parted.

"I ever point to that day," Rockefeller said a half century later, "as the beginning of the success I have made in my life."

That handshake also signaled the beginning of the modern oil industry, which brought order out of the chaos of the wild Pennsylvania boom. The order would take the form of Standard Oil, which, as it sought total dominance and mastery over the world oil trade, grew into a complex global enterprise that carried cheap illumination, the "new light," to the farthest corners of the earth. The company operated according to the merciless methods and unbridled lust of late-nineteenth-century capitalism; yet it also opened a new era, for it developed into one of the world's first and biggest multinational corporations.¹⁵