GSA Bulletin, v. 32, p. 171–186 (31 March 1921) *Read before the Society 28 December 1920*

PRESIDENTIAL ADDRESS OF ISRAEL C. WHITE

IMPORTANT EPOCHS IN THE HISTORY OF PETROLEUM AND NATURAL GAS[1]

Contents

ANCIENT REFERENCES TO PETROLEUM

The date of the first use of petroleum or its residual products, pitch and asphaltum, precedes authentic history. Probably the first recorded utilization is that in the 11th chapter of Genesis, in which it is stated that the soft or semi-fluid bitumen found in the valley of the Euphrates, then translated "slime," was used as mortar in the building of Babylon more than forty centuries ago. Eratosthenes, a celebrated Grecian writer who lived in the third century B.C., has described this bitumen from the Springs of Hit, on the Euphrates, and has also told of its use in the construction of mosaics, pavements, etcetera, in the beautiful palaces and temples of ancient Nineveh and Babylon.

Herodotus, who lived 2,400 years ago, has related how asphaltic oil was produced in his day from a lake on the island of Zante, in the Mediterranean, off the coast of Greece, by swabbing it up with a branch of myrtle, very much like the early settlers of the Allegheny and Little Kanawha valleys of Pennsylvania and West Virginia collected petroleum from the surface of water with wooden cloths; so that in the primitive methods of procuring mineral oil three is apparently "nothing new under the sun." Aristotle, who lived in the fourth century B.C., has described the deposits of bitumen in Albania, along the eastern shores of the Adriatic Sea, while Pliny and Dioscorides, who lived in the first century of the Christian era, have given an account of the oil springs of the island of Sicily and the use of petroleum in lamps under the name of "Sicilian oil." Many ancient writers and travelers, like Plutarch, Strabo, Marco Polo, and others, have recorded the use of "rock oil" and pitch in Arabia, Persia, India, and elsewhere from the earliest historic periods.

RELIGIOUS CULT FOUNDED ON NATURAL GAS SPRINGS

One of the nearly extinct religious cults, that of the Fire Worshipers, or Parsees, was founded on the mystery which the priesthood of that religion threw around the perpetual fire maintained on the altars of their temples with natural gas. When your speaker visited Baku, on the shore of the Caspian Sea, in 1897, he saw the ruins of one of these mystic shrines, the last of whose priests had disappeared only twenty-odd years before. In dismantling the altar of this ancient structure, it was discovered that it had been built over a fissure in the earth from which natural gas issued, and that a secret pipe conducted the gas from the fissure to the altar, where its lambent flames had inspired the Fire Worshippers with a belief in the supernatural powers of the priests of the Zoroaster. It is possible that similar tricks of deception have imposed on

[1] Manuscript received by the Society 17 January 1921.

the credulity of mankind during the childhood of the race in the establishment of other primitive religious beliefs.

ANTIQUITY OF USE IN CHINA AND JAPAN

In China, whose civilization has remained practically unchanged for so many centuries, crude methods of using natural gas were practiced more than two thousand years ago, while the Japanese have also collected and utilized mineral oil for many hundreds of years.

Hence we find that the oil and gas seepages welling up through fissures in the earth's stratified crust were both observed and used by primitive peoples of most every country.

EARLIEST AMERICAN ACCOUNTS OF PETROLEUM AND NATURAL GAS

The earliest written accounts of the occurrence of petroleum in America is apparently that of a Jesuit missionary, who came from Canada into New York in 1629 and wrote a letter concerning it, which was published in Sagard's "History of Canada" in 1632.

The petroleum seepages in Oil Creek, Pennsylvania, and on Hughes and Little Kanawha rivers, in what is now West Virginia, were doubtless known and used by the Indians long before white men visited the regions or Columbus landed in America. The earliest published account of the oil springs near Titusville, Pennsylvania, appears to be that of a Swedish traveler, one Peter Kalm, about 1750, while those of the Wirt and Ritchie counties of West Virginia, as well as of similar seepages on the Big and Little Muskingum rivers of Ohio, were first described in an article published in "The American Journal of Science and Arts," New Haven, Connecticut, for February, 1826. In speaking of the flows of petroleum from the salt well of the Little Muskingum, which interfered seriously with salt production, he says: "Petroleum affords considerable profit and is beginning to be in demand for lamps in workshops and manufactories. It affords a clear, brisk light when burnt this way, and will be a valuable article for lighting the street lamps in the future cities of Ohio."

PENNSYLVANIA ORIGINATED PETROLEUM INDUSTRY

Pennsylvania is generally given the credit for originating the petroleum industry, because it was on the Watson flats, near Titusville, that the first well was purposely drilled for petroleum, although, in drilling for brines, casing, jars, and drilling tools generally had all been invented by citizens of what is now West Virginia, a half century before Colonel Drake completed the historic well on the banks of Oil Creek.

WEST VIRGINIA FIRST IN UTILIZING NATURAL GAS

In discovering and utilizing natural gas, West Virginia clearly had precedence over Pennsylvania, for probably the first recorded reference to this valuable fluid in the United States was made as early as 1775 by General Washington, who preempted the land around the "burning spring," nine miles above Charleston, in the Great Kanawha Valley, which he described as "A bituminous spring of so inflammable a nature as to burst forth" (take fire) "as freely as spirits and is nearly as difficult to extinguish." It is also well known that the first use of natural gas for manufacturing purposes in America was by Mr. William Tompkins in the same Kanawha Valley, who in 1841 struck a large flow of gas in boring a salt well only a few hundred feet distant from the "burning spring" that Washington had noted 66 years before and, piping the gas to his salt works, used it instead of coal in boiling down the brines, displacing several hundred bushels of coal daily. These early utilizations of petroleum and natural gas in America and many other countries of the world, however, were all meager, sporadic, and of no general economic importance.

COLONEL DRAKE'S WELL THE REAL BEGINNING OF THE PETROLEUM INDUSTRY

In spite of the fact that these valuable hydrocarbons had been known to the human race for more than twenty-five centuries, it remained for the American, Col. E.L. Drake, of the Seneca Oil Company, to become the real founder of the petroleum industry, when, on August 28,

1859, only 61 years ago, he completed the famous well on Oil Creek, near Titusville, Venango County, Pennsylvania. This notable event in petroleum history, occurring at a time when "rock oil" was selling for $25 to $30 per barrel, soon led to a drilling campaign of wide extent, spreading to Ohio, West Virginia, and Canada in 1860, and to Russia in 1862, where hand digging of wells was carried on until seven years later, when it was supplanted by the drill, the production of Russia then rising from 37,400 barrels in 1863 to 203,000 in 1869.

MODERN HISTORY OF PETROLEUM AND NATURAL GAS DIVISIBLE INTO THREE PRINCIPLE EPOCHS

The historical development of petroleum and natural gas since 1862 is naturally divisible into three periods of approximately twenty years each, characterized by different phases of progress.

Characteristics of First Epoch

The twenty years of petroleum and natural gas history from 1862 to 1883 might be termed the epoch of mechanical invention in the production and transportation of petroleum. It was during this period that methods for deep drilling were perfected, and the fields of Pennsylvania especially were exploited and further developed, the extensions into Ohio and West Virginia not spreading far from the original developments. Transportation of oil through pipe lines and tank cars was introduced during this epoch, and refining methods were also extended and improved, while very large gas wells were incidentally discovered in drilling for petroleum.

It was near the close of this period (1882) that the Standard Oil Trust was formed, and it became the chief agent in promoting a world-wide market for American petroleum and its many refinery products.

Characteristics of the Second Epoch

The next 20-year epoch of petroleum and natural gas history, beginning in 1883, was noteworthy in many respects. It marked the rise of the natural gas industry and the general introduction of gaseous fuel into domestic use throughout the petroleum fields, as well as its greatly extended use in the manufacturing industry. It was in 1883 that Spang, Chalfant & Company and Graff, Bennett & Company laid a six-inch pipe line from their iron works on the Allegheny River to a large gas well in Butler County, Pennsylvania, and, turning the same into the line, found that the rock pressure of the gas was able to force a large supply through to their factories, sufficient to take care of all their fuel needs in the smelting of billets and the manufacture of iron into the many forms of finished product. This successful experiment in the long-distance transportation of natural gas through its own expansive power rapidly led to a vast extension of pipe lines, and the natural gas industry had its birth.

It was the desire of capital to enter this field in an intelligent manner that led one great oil corporation (the Forest Oil Company, a subsidiary of the Standard Oil Company of New Jersey) to seek the advice of your speaker, who, as the result of his field-work, discovered anew the neglected and forgotten "Anticlinal Theory" of Hunt, Andrews, and Hoeffer, which he vitalized and regenerated for a time. Before this rediscovery, in June, 1882, and its later publication in "Science," the finding of new oil and gas pools in the United States beyond the boundaries of Pennsylvania, southern New York, southeastern Ohio, and the Volcano arch of West Virginia had made practically no progress.

Many wells, it is true, had been drilled in other States, but nothing of importance had resulted therefrom, since there was no consistent theory to guide the drill in its search for the hidden treasures of oil and gas. Indeed, to such a low estate had the efforts of geologists fallen in their attempts to aid the drill in discovering petroleum and natural gas previous to the publication of the "Anticlinal Theory" by your speaker, in the issue of "Science" for June 26, 1885, and his successful demonstration of its great value in locating pools of oil and gas, that one prominent oil operator, disgusted at frequent failures of geologists to locate productive oil pools for him, was heard to remark, that if he desired to be absolutely sure of getting a dry hole he would employ a geologist to make the location. But with the new announcement of the "Anticlinal" or structural

theory as a guide, the development of oil and gas spread across West Virginia into Kentucky, and passed from Ohio into Indiana on its westward march to Kansas, Texas, and Louisiana, finally reaching California and Mexico before the close of this second 20-year epoch, in 1902.

Characteristics of the Third Epoch

The third 20-year epoch of petroleum and natural gas history is nearing its close. It has been characterized specially by the large production and utilization of gasoline, brought about principally through the invention of the internal combustion engine and the general introduction on liquid fuel where available for locomotive, steamship, and other industrial purposes, the Diesel engine having done for heavy liquid fuels what the general internal combustion engine has done for gasoline. The automobile and the aeroplane are only two of the inventions made practical through gasoline and the internal combustion engine. In the meantime the structural theory of oil occurrence has led to a world-wide development of oil fields. It has added Kansas, Oklahoma, Wyoming, Montana, Texas, Louisiana, California, Cuba, Haiti, Colombia, Venezuela, Guiana, Trinidad, Barbados, Equador, Peru, Argentina, and other regions of the new world, while Rumania, Galicia, Italy, Persia, British India, Egypt, Dutch East Indies, Japan, Formosa, and many other countries of the old world have yielded rich supplies of oil, the latest reports being that the domes and anticlinals of Australia as well as of the Arctic regions of America are proving rich in oil and gas. Who is there that can doubt that Africa (outside of Egypt), with its unexplored and unknown mineral wealth, will yet yield large quantities of petroleum and natural gas when its sedimentary terranes are intelligently explored.

CRITICISMS OF THE "ANTICLINAL THEORY"

In this connection it will not be irrelevant to speak of some criticisms of the "Anticlinal" or structural theory of oil and gas accumulation into pools of commercial value. Your speaker has always attributed the chief and controlling factor of oil and gas accumulation to the action of gravity. For several years many able geologists have endeavored to prove that some other forces, like capillarity, for instance, has been prepotent in the accumulation of oil and gas, and that gravity operating through structure has had little or nothing to do with the matter. It has always been observed, however, that when these critics of the "Anticlinal Theory" go into the field to search out possible oil and gas territory upon which they would advise their clients to spend money in a search for these fugitive minerals, they invariably select the most prominent anticlinals and domes they can find within the regions considered worthy of exploration.

In the Journal of Geology, volume 27, 1919, pages 252–262, Mr. A.W. McCoy, under the title of "Notes on principles of oil accumulation," attempts to show from small laboratory experiments that the main potent factors operating to accumulate oil and gas into pools of commercial value are those due to capillary forces, and that the sole effect of "anticlinal structure" on such accumulation is the development of faults, fractures, or minute fissures parallel to the anticlinals, through which alone oil and gas can pass to higher levels, thus relegating gravity or the buoyancy of oil and gas to the scrap-heap of exploded theories, so far as playing any effective part in the accumulation of oil and gas pools is concerned.

However, some inquiring minds were not satisfied with the character of Mr. McCoy's experiments and regarded them as inconclusive. Among this number was Mr. R. Van A. Mills, of the U.S. Bureau of Mines, that great government institution which, along with the U.S. Geological Survey, has done so much for the oil and gas industry, and to the successful founding of which a distinguished Fellow of this Society, the late Dr. Joseph A. Holmes, yielded up his useful life, quite as great a hero as any who fell on "Flanders Fields." Mr. Mills has given in Economic Geology, volume XV, number 5, July-August, 1920, pages 398 to 421, under the title of "Experimental studies of subsurface relationships in oil and gas fields," a preliminary announcement of the results of his elaborate experiments, with adequate equipment and simulating as closely as possible the subsurface conditions to be found in every oil and gas field. By means of these experiments he

not only demonstrated the overwhelming preponderance of gravity as the principal factor in oil and gas accumulation, but proved the minor part played by capillary. The "Anticlinal," or gravitational, theory for oil and gas segregation into valuable pools having always been insisted on by your speaker as the main and controlling factor, it is with considerable satisfaction that, after many assaults by able but mistaken geologists, the buoyancy theory has been so signally sustained through these exhaustive and demonstrative experiments of Mr. Mills, whose results are briefly set forth in his concluding summary as follows:

Summary of R. Van A. Mills' Results

"To enumerate the various relationships indicated by the investigations herein described would require a longer paper than is appropriate at this time. Consequently, in addition to the conclusions from the experiments, the present contribution is summarized by a statement of a few of the broad facts and relationships that have been established.

"One of the most important things to be realized is that all of the phenomena observed in the laboratory, as well as in the field, are brought about through the influence of various factors with different effects. In other words, we are obliged to deal with the summation of the effects of many factors, not with the effect of any single factor. The values of the different factors that influence the migration, accumulation, mode of occurrence, and the recovery of oil and gas are extremely variable and are relative one to another. Different factors have predominating influences according to the different sets of limiting conditions into which enter, collectively, the porosities, fineness of pores, textural variations, and degrees of dip of the sands, the qualities of the fluids, more especially the viscosities of the oils, the degrees of saturation of the strata by water and oil, the temperatures, pressures, and many other conditions. Thus, it is recognized that there is a wide range of variation in the nature and extent of induced movements, especially the differential movements of gases, oils, and waters upon which recovery, together with the effects of water upon recovery, very largely depend. It is further recognized that gas mixed with oil facilitates lateral as well as vertical migrations of oil in water-bearing strata. Again, it is recognized that there may be a limit to the fineness of water-filled interstices beyond which viscous oils do not appear to migrate 'gravitationally' under ordinary conditions. It is further recognized that in a medium-grained, water-saturated sand a single globule of oil fails to migrate 'gravitationally.' But as more globules of oil are added to it, there is formed an aggregation of globules whose cumulative buoyancy is sufficient to overcome the resistance of upward migration. Such relationships are important in the consideration of up-dip migrations. We must keep constantly in mind the critical conditions up to which certain phenomena hold true, but beyond which there are absolutely different phenomena.

"The field and laboratory investigations that the writer has so far made indicate that under ordinary field conditions the up-dip migration of oil and gas under the propulsive force of their buoyancy in water, as well as the migration of oil, either up- or down-dip, caused by hydraulic currents are among the primary factors influencing both the accumulation and the recovery of oil and gas.

"The terms 'up-dip migration' and 'down-dip migration,' as used in this paper, apply to migrations that are in accordance with the configuration of the tops of the sands, regardless of actual structures. It must be remembered that there are many subsurface conditions, such as the domelike tops of lenses, irregularities in the tops of sands, and irregular textural barriers, which bear no consistent relations to structure, but whose influence upon oil and gas accumulation are analogous to those of true anticlines and domes. The writer's remarks apply to these conditions which he terms structural analogies.

"In concluding this paper, the writer calls attention to the views recently set forth in the literature,[2] that the migration and accumulation of oil in water-saturated strata are caused mainly by capillary forces; that oil does not migrate up the dip, due to the difference in specific gravity between oil and water, and that oil is not propelled through sand by hydraulic currents. It is further maintained that oil has been forced out of the fine bituminous shales adjacent to the reservoir rocks by the capillary action of

[2] A.W. McCoy: "Notes on principles of oil accumulations." Jour. of Geology, vol. 27, 1919, pp. 252-262. W.F. Jones: "The relation of oil pools to ancient shorelines." Economic Geology, vol. 15, 1920, pp. 81-87.

> water, and that no wide lateral movements of oils have subsequently taken place.
>
> "The writer can not accept these views as generalizations. They may appear to hold true under exceptional conditions, as in small-scale laboratory experiments, where the conditions of experimentation are especially favorable to the hypotheses, but they do not generally hold true, either in the laboratory or in the field. Capillary adjustments between oil and water in saturated strata are restricted within short lateral ranges, amounting to only a few centimeters in the writer's experiments. The principle role of capillary, in saturated strata, is to retard rather than to promote fluid movements."

The thorough and careful investigations and experimental proof of the preponderance of gravity in oil and gas accumulation, as well as the demonstration of the very small effect of the capillarity factor, should dispose once and for all the claims that capillarity has played the principle role in the movement of oil and gas into pools of commercial value.

VALUE OF PETROLEUM FOR MARITIME FUEL

It was during the present 20-year epoch that the maritime nations of the world have realized the great value of liquid fuel, not only in the arts of peace, but also in the arts of war. Some one has well said that during the late World War "The navies of the allies floated to victory on a sea of oil." The lessons of the war with respect to the use of liquid fuel in naval warfare were so impressive to Great Britain and France that they did not even await the termination of that titanic struggle before sending their shrewdest representatives in statecraft to Persia to secure the Anglo-Persian treaty excluding all but their own nationals from any participation in the development and exploitation of these potentially great oil fields. Dr. George Otis Smith, the distinguished Director of the U.S. Geological Survey, and his able Chief Geologist, Dr. David White, have sounded a note of alarm which has finally induced our State Department to protest these exclusive treaties. This protest should have been made long ago, before the close of the war, when our wishes would have met with instant attention. It is to be hoped that the new administration that the people have so unanimously called to the helm of the state after March 4 next will see to it that the control of this great industry founded by American genius and initiative, which gave all the people of the earth a cheaper and better light, whose radiant beams have illuminated every household of the world, shall not pass to other hands except through fair and legitimate competition, and that a treaty concluded with Persia while America was putting all of her resources at the command of Great Britain to save both Britain and France, as well as civilization, from destruction, shall not be permitted to shut out our nationals from any share in the development of these rich foreign fields, while we at the same time permit the English, the French, and the Dutch to own and operate any of our lands for oil and gas in every portion of the United States, and of which liberal treatment all these nations are taking great advantage.

PEAK OF PRODUCTION REACHED

It is altogether probable that the peak of oil production in the United States has either been attained during the present year or will be reached in 1921. The peak of natural gas production was passed in 1917 and is rapidly declining on its long downward path to inevitable extinction. In spite of the vast waste accompanying its introduction, it has accomplished a useful purpose in educating millions of people to the cleanliness and convenience of gaseous fuel. Hence, when natural gas is no longer available, its place will be largely supplied by manufactured gas derived partially from by-product coke ovens, the gas from which source was formerly consumed in the wasteful beehive oven process of making coke, along with other products of immense value that are now being recovered and utilized.

EXHAUSTION OF PETROLEUM

However, all agree that, with the vast increase in the use of liquid fuel through the automobile, the aeroplane, the truck, the farm tractor, the locomotive, and the ship, even the present enormous supplies of petroleum will

soon fail to meet the ever-increasing demand for this convenient form of power. Whither shall our nation turn for a substitute? Fortunately dame Nature has been extremely provident to the United States. In addition to giving her very large and rich oil and gas fields, she has endowed her with approximately one-half of the coal supply of the world, as also with enormous quantities of bituminous shales, out of which both gaseous and liquid fuels can be extracted in much greater volume than those yielded to the drill from old mother Earth. The mountains of oil shale in Colorado, Wyoming, and Utah, together with the coal beds and bituminous shales of nearly every State in the Union, stand ready to yield up their content of oil and gas through intelligent chemical and metallurgical treatment when the natural sources no longer furnish an adequate supply of these convenient (oil and gas) hydrocarbons. Therefore, with the all of our mountain streams and cataracts utilized in electric current for transporting our railway trains over and under our hills and mountains, as also for many other resources, Americans can face the future with every assurance that their heritage of fuels and water-power, if intelligently utilized and conserved, will be sufficient to supply all of the necessities of civilization to a far distant future. There has been a fear that with the disappearance of our petroleum no practical substitute for gasoline could be found. Such fears overlook the fact that from every ton of bituminous coal two and one-half to three gallons of benzol can be extracted by the by-product coking process, an even more efficient motor fuel for automobiles, tractors, aeroplanes, etcetera, than gasoline, while by the "carbocoal"[3] process recently put into successful operation at Irvington, New Jersey, on a small scale and at South Clinchfield, Virginia, on a large scale, by the International Coal Products Corporation, not only is a substitute for anthracite produced from bituminous coal, as briquets, but from each ton thereof 30 gallons of tarry

[3] Description of the Carbocoal Process
The carbocoal process includes three distinct stages:
1. Primary distillation.
2. Briquetting.
3. Secondary distillation.
In the process the by-products are recovered from the gas of both distillations.
Primary distillation. — The initial step in the carbocoal process is a continuous low temperature distillation. The coal to be carbonized is first ground to one-fourth of an inch or smaller and then delivered to the primary retorts, where it is distilled at a relatively low temperature, 850° to 900° Fahrenheit, the volatile content of the coal being reduced to approximately 8 per cent. The result of this primary distillation is a large yield of tar, gas of a high thermal value, and a product rich in carbon, called "semi-carbocoal."
The characteristic feature of the primary distillation is that it is continuous, and that the coal is constantly agitated and mixed during the entire operation. This is accomplished by a twin set of paddles, each revolving slowly, in opposite directions, and so pitched as to advance the charge through the retort. By this means all portions of the charge are uniformly distilled, and by controlling the speed at which the charge moves through the retort the distillation may be carried to any desired state. Due to the low temperature of distillation and to the partial carbonization in the primary ovens, the hard metallic cells characteristic of coke are avoided. The period of this distillation is from two to three hours, and each retort has a carbonizing capacity of 24 tons or more of raw coal per day.
Briquetting.—The semi-carbocoal, after being discharged through the primary retort, is ground and mixed with a certain proportion of pitch, obtained from the tar recovered in the process, and this mixture is briquetted.
Secondary distillation.—The briquets coming from the briquetting plant, which are termed "raw briquets," are delivered to the secondary retorts, where they are subjected to an additional distillation at a higher temperature, approximately 1,800° Fahrenheit, resulting in the production of "carbocoal," the recovery of additional tar and gas, and a substantial yield of ammonium sulfate.
In the secondary distillation, pitch as a separate ingredient of the raw briquet disappears. There is a marked shrinkage in the volume of briquette, with a corresponding increase in density, but no distortion in its shape. This distillation requires about six hours and is performed in an incline retort, using gravity charge and discharge. The capacity of these retorts is approximately 60 tons of raw briquets per day.
The "carbocoal," which is the final product, represents approximately 70 per cent of the weight of the raw coal, the exact percentage depending on the volatile content of the coal. The process is self-contained—that is, it produces sufficient gas and in most cases an excess over and above that required for carbonizing purposes.
Products from Process
From careful measurements made with Pittsburgh and Clinchfield coals containing approximately 35 per cent volatile material, and confirmed by numerous tests of other coals containing a similar percentage of volatile matter, the following average yields from one net ton of coal have been obtained:
65 to 70 per cent of carbocoal briquets.
15 to 20 gallons of tar oil products.
20 pounds of sulphate of ammonia.
2,000 cubic feet of surplus gas (550 B.T.U.).

and oily residues are derived, from which 15 to 20 gallons of marketable oils can be obtained, all of which are available for liquid fuel, and also two to three gallons of light oil that can be stripped from the resulting gases before the latter are used as a source of heat in the manufacture of the carbocoal briquets. Hence, while the increasing use of liquid fuels may outstrip the production of petroleum in the near future, yet with the vast reserve that must exist in the unexplored and undeveloped regions of the earth and the enormous amount of potential oils that are locked up in our coals and bituminous shales, to be released at the bidding of our chemical engineers, there would appear to be no cause for immediate alarm over any possible shortage of oils or motor spirits in the near future.

ORIGIN OF PETROLEUM

With reference to the origin of petroleum and natural gas, geologists appear to be generally agreed that their source must be found in organic life, either directly or indirectly. The fact that no commercial accumulations of either are found outside of marine beds, except where these accumulations have clearly come up from marine beds below, would point to the sea as the ultimate source of the organisms or raw material from which these hydrocarbons were derived. Whether the petroleum and natural gas as we find them stored in porous sedimentary strata originated directly from the decomposition of marine plants and animals, or whether they originated from the subsequent slow distillation of the kerogen produced in the shales from the imbedded organisms, is a question not yet fully determined and possibly never may be settled beyond cavil, although the preponderance of present evidence would point to the kerogen distillation at low temperature as the immediate source.

MASTER MIND OF THE STANDARD OIL COMPANY

This imperfect sketch of petroleum and natural gas history can not be closed without special reference to the conspicuous part played in this history by one of the great captains of the American petroleum industry. One of the very few men who founded the Standard Oil Company has taken such a leading position in petroleum history, as well as in the general industrial history of the world, that any sketch of oil and gas history without special reference to his part in the greatest business success of the ages would be very incomplete. The master mind of the Standard Oil Trust was John D. Rockefeller, of Cleveland, Ohio. Born in Richford, Tioga County, New York, July 8, 1839, he came with his parents to Cleveland in 1853, where, after completing a two years' course in high school and a summer's course in a commercial school, at the age of 16 he began his remarkable business career as an employee in a commission house at a salary of $4.00 a week. Here his faithful work and native talent soon brought a promotion to cashier and bookkeeper, with increase of salary to $700 a year. At the age of 19 he had saved up $1,000 and concluded to go into the commission business himself, after borrowing another thousand from his father. Starting on his business career in 1858 with this modest capital, the fruit of his boyhood thrift and savings in three years, his meteoric business progress from this simple beginning to that of the richest man in the world illustrates in a striking way how, under the freedom of American institutions, not only the "rail-splitter," the "tanner," or any other class of common laborer may rise to the Chief Magistracy of the Nation, but that the poor boy may become the richest citizen of the world through his own unaided genius and initiative.

The very next year after Colonel Drake had discovered a method of securing from the earth large quantities of petroleum young Rockefeller had the vision to foresee the possibility of furnishing the world with a new, better, and cheaper light than the tallow dip then universally in use. Hence, entering the refining business in 1862, only three years after Colonel Drake's discovery, his name and the business organizations founded principally through him have been inseparably connected with the history of petroleum and natural gas ever since.

SANCTITY OF PRIVATE PROPERTY THE ONLY PATH TO PROGRESS

It has been only a short time since it was quite the popular thing for some men of narrow vision and superficial acquaintance with the practical business affairs of life to sneer at such men as Mr. Rockefeller, whose wealth has been accumulated so largely from industries founded upon petroleum and natural gas, and even to advocate the rejection of any philanthropic gifts, as "tainted money," when proffered by men who had through foresight, industry, and thrift accumulated large fortunes. The business success of Mr. Rockefeller represents the American theory of the sanctity of private property, the greatest incentive to individual effort and the general progress of civilization, as opposed to Bolshevism and Communism, which regard all privately owned property as but another name for theft, and which would have the State take over and either redistribute all private fortunes or possess them for the benefit of not all, but of a class (the proletariat), after the capitalists had been dispossessed and drived [*sic*] out or killed. This later theory of government and property, fortunately for the future progress and stability of civilization, has recently been put to the test of actual trial on an enormous scale, involving the destinies of more than one hundred million of the human race. Lenin and Trotsky have had unlimited opportunity to make a practical test of the Communistic theory, that all privately owned property represents robbery of the poor, and that everything, including men, women, and children, should be nationalized. What are the results? Let torn, bleeding, starving anarchistic Russia answer as to the outcome of dividing up accumulated wealth and property among the masses. Let her idle factories, whose foremen and experts have either been murdered or driven into exile; her uncultivated and grainless fields; her unemployed and starving professors and educated classes; her murdered citizens of the frugal and property-owning class; her lust-corrupted school children of both sexes; her communized and violated women; her enslaved and terrorized laborers, ruled by a despotism more cruel and heartless than even that of Ivan the Terrible, answer as to the merits of Red class rule of the proletariat compared to that of our free and glorious democracy, where the accumulation of privately owned property by thrift, industry, and sacrifice is not yet regarded as criminal by the large majority of American citizens.

This great university, under whose sheltering domes our scientific societies meet—its stately and beautiful temples, in which the accumulated knowledge of all time finds such splendid exposition by hundreds of learned minds—could not have been called into existence except for the business foresight, the master minds to grasp the possibilities of the petroleum industry, which, through labor and sacrifice, thrift and endurance, Mr. Rockefeller and his associates carried forward to commercial success in every quarter of the world. This university, the Rockefeller Foundation, the Rockefeller Institute for Medical Research, the Laura Spelman Rockefeller Memorial, Mr. Rockefeller's latest gift of $63,000,000 for charitable purposes, the countless benefactions to colleges, universities, churches, and to every cause worthy of human endeavor, totaling the enormous sum of five hundred millions, as Mr. Rockefeller's present contribution to human welfare, should be a sufficient answer to those who would overturn our present private property system and substitute therefor [*sic*] any kind of communistic government. The example of Russia on a large scale and that of William Lane in Paraguay on a small scale give the same answer; the end of both is idleness, starvation, crime, and barbarism.

It is to be hoped, in view of these two conspicuous failures of Communism to alleviate the ills of mankind, that all thinking minds, especially in our colleges and universities, whose teaching staffs have not been entirely free from the delusion which Karl Marx did so much to promote, will abandon forever the idea of State Communism as a cure-all for poverty, crime, and all the other ills that have always afflicted humanity and always will, so long as envy, jealousy, greed, cruelty, and other vicious principles in human nature remain the common inheritance of the race. The little attention yet given to

eugenics by the vast majority will evidently postpone to a very remote future the day when all the wolfish propensities shall disappear from mankind, and until that day dawns it would appear to be the part and the only path to progress to preserve inviolate the sanctity of private property, the keystone on which all present civilization rests.

Transcribed from the original GSA Bulletin article for posting on the Web in March 2013.

Israel C. White