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AN OUTLINE OF THE MINERAL RESOURCES OF NEW MEXICO

By

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Value of New Mexico Mineral Production

The utilization of her mineral wealth constitutes one of New Mexico's greatest industries. The value of the state's mineral Products for the five-year period from 1925 to 1929 inclusive was approximately \$151,500,000 or an average of \$30,300,000 per year. Final figures for most of the individual products were net available in August, 1929, and only estimates could be given. The approximate total value of New Mexico's mineral production in 1929 was \$37,722,000. Most of the production figures are from the U. S. Bureau of Mines.

Value of mineral products produced in New Mexico in 1929 (est.)

C l a y a n d c l a y p r o d u c t s	240,000
C o a l	8,314,000
Copper	17,900,000
Gold	707,000
L e a d	1,397,000
Petroleum and its products.....	2,500,000
Sand and gravel.....	300,000
Silver	582,000
Zinc	4,522,000
Miscellaneous, including fluorspar, gems, gypsum, iron, lithium minerals, manganese, mica, mineral waters, molybdenum, salt, and stone	<u>1,260,000</u>
	\$37,722,000

Classification

The mineral resources of New Mexico are here classified under three heads, namely: (1) Metals, (2) Non-metallic Minerals, and (3) Hydrocarbons.

Metals

When considering New Mexico as a mining state, the metals naturally come first to mind. In the past their value has been greater than that of the non-metallic minerals and hydrocarbons combined.

Among the metals, consideration is first given to those which have been extensively mined and which are likely to appear in the production tabulations for some time to come. These in the order taken up are copper, zinc, lead, gold, silver, iron, manganese, and molybdenum.

A number of other metals occur in New Mexico. Some of them have only been mined in a small way or not at all, due to such factors as small size of the ore bodies, low grade of the ore, high cost of transportation, etc., and several may never attain commercial importance. In this group are antimony, arsenic, bismuth, radium, tin, tungsten and vanadium. They are considered briefly in this order. Following these, several additional New Mexico metals which, so far as known, are only of scientific interest are listed.

The historian finds much of interest in the story of the mining of the common metals in New Mexico. The great Chino copper deposits at Santa Rita, Grant County, were first mined in 1801, a year after they were brought to the attention of the Spaniard, Colonel Jose Manuel Carrasco, by an Indian in return for some service rendered. The only authentic underground metal mining of importance in the United States antedating the operations at Santa Rita was at the Michigan native copper deposits. Part of the copper mined in the nineteenth century was transported on mules to Mexico City, and later it was hauled 700 miles by wagon to Trinidad, Colorado, the nearest railroad shipping point at that time.

The era of gold placer mining in New Mexico followed, the discovery of the Old Placers in the Ortiz Mountains south of Santa Fe in 1828, this constituting the first authentic placer mining in the United States west of the Mississippi River. The Ortiz gold quartz veins near the Old Placers were worked as early as 1833.

The recent revolutionary progress made in selective flotation in concentrating complex ores carrying chiefly lead and zinc but smaller quantities of copper and frequently gold and silver has made it possible to work profitably some of the complex ore deposits of New Mexico. The outstanding example of this development is the Pecos mine of the American Metal Company in San Miguel County. This property has become the chief producer of zinc, lead, gold and silver in the state. The ore is treated in a flotation mill having a capacity of 600 tons per day.

In 1929 an excellent body of complex ore was developed at the Groundhog mine near Hanover, Grant County. This mine is an important factor in the New Mexico production of zinc, lead, copper, and silver. Selective flotation has been the solution of the concentration problem of this ore.

Copper. - For many years copper has been the leading metal produced in New Mexico. In 1929 the copper production was about 100,000,000 pounds, valued at 017,900,000. The production of the Chino mines of the Nevada Consolidated Copper Company, at Santa Rita, Grant County, marketed as concentrates from the mill at Hurley,

amounted to about 85 per cent of the state's yield for the year. The Lordsburg district produced considerable copper ore in 1929, and moderate quantities were mined near Fierro, Grant County, Pastura, Guadalupe County, and Scholle, Torrance County.

New Mexico's greatest metal mining property is undoubtedly the Chino mines of the Nevada Consolidated Copper Company. These deposits were worked on a small scale and by underground methods most of the time from 1801 to 1909. The entire copper production of the district from its discovery to 1909 was about 100,000,000 pounds, or about as much copper as can be produced in one year with current methods of mining and milling.

Exploration with Churn drills in 1906-1908 proved that the Chino copper deposit contained many millions of tons of low-grade copper ore susceptible to mining with steam shovels in open pits. The Chino Copper Company, which later became a part of the Nevada Consolidated Copper Company, was organized in 1909 for the purpose of working these deposits. From 1912 to 1929, inclusive, the total production was about 1,035,000,000 pounds of copper valued at approximately \$176,000,000. The Chino mill has a capacity of 15,000 tons of ore per day.

The ore reserves of the Chino mines are literally stupendous, amounting to more than 100,000,000 tons with a copper content of about 1.4 per cent. In other words, the Chino deposits contain more than 2,800,000,000 pounds of unmined copper.

At Tyrone, Grant County, large low-grade copper deposits occur. Considerable ore was mined and milled here by the Phelps Dodge Corporation from 1916 to 1921, when the property was closed down.

Copper should continue to hold its rank as New Mexico's most valuable metal for years to come, but it is probable that oil will soon supplant it as the most valuable single mineral product.

The most important uses of copper are in various electrical manufactures, telephones, telegraphs, transmission lines, automobiles, and buildings.

Zinc. - New Mexico produced in 1929 in zinc ores and concentrates about 62,406,000 pounds of zinc valued at \$4,522,000. The zinc production came chiefly from the Pecos mine of the American Metal Co. Considerable zinc was produced in the vicinity of Hanover, Grant County, at the Hanover mine of the Empire Zinc Company, the Black Hawk mine, the Peru mine, and the Groundhog mine.

The Magdalena mining district, Socorro County, yielded considerable lead and smaller amounts of copper and silver from its discovery in 1866 to 1903. In the latter year large bodies of zinc ore were discovered, and the district was an important producer of zinc until after the World War. The value of the total metal production of the Magdalena district is in the neighborhood of \$30,000,000.

Since 1910 the Hanover mines of the Empire Zinc Company have yielded considerable zinc.

Zinc should continue to rank next to copper in value among the metals produced.

The outstanding uses of zinc are as follows: in the form of rolled sheets, as the coating of galvanized iron, and as a constituent of brass and bronze.

Lead. - Ores of lead have been mined in various districts and some mines have a fair record as producers. Many New Mexico lead ores carry important quantities of silver. In 1929 lead ores were shipped from the following districts: Organ Mountains, Dona Ana County, Hachita, Hidalgo County, Hanover, Grant County, Steins, Hidalgo Country, and Magdalena, Socorro County. Lead concentrates "ore made at the Pecos mill of the American Metal Company, the Combination mill at Hanover, and the Peru mill near Deming. The amount lead produced in 1929 was 22,000,000 pounds and its value approximately \$1,397,000. There should be a moderate increase in lead production in the next few years.

The chief uses of lead are in paints, storage batteries, cable covering, and buildings.

Gold. - Gold is obtained from both placers and lode deposits. Placer mining, of considerable importance in the early mining history of the state, has been insignificant in recent years. The principal placer districts are the Old Placers at Dolores and the New Placers at Golden, both in Santa Fe County, Elizabethtown district, Colfax County, Hillsboro district, Sierra County, and Pinos Altos district, Grant County.

The production of gold from lode deposits has fluctuated greatly. A large part of the recent production has come from complex ores. Gold produced in 1929 had an approximate value of \$707,000. The Mogollon district, Catron County, since its discovery in 1875, has yielded gold-silver ore worth about \$20,000,000, approximately 40 per cent of this sum being due to gold. The larger Mogollon mines closed down in 1925. The Aztec mine in Colfax County has operated intermittently since its discovery in 1868 and some years show a fairly large production of gold.

An active search is being made in New Mexico for workable gold deposits, and it is not unlikely that gold production will increase moderately.

Gold is the standard of value. Its uses in coinage and jewelry are well known.

Silver. - In the early days of mining in New Mexico much silver was obtained from deposits whose value consisted almost entirely of this metal. The Lake Valley district, Sierra County, was one of the

early well-known silver mines of the state and the old Kingston district of the same county has an excellent record for the amount of silver produced. Chloride Flat and other districts in Grant County produced much silver ore in the eighties and nineties. The Mogollon district, with a silver production of approximately \$11,500,000, heads the list of New Mexico silver-producing districts.

Recent silver production has come chiefly from ores in which lead, copper, or zinc was the important metal. The complex ores of the Pecos mines of the American Metal Company yield moderate amounts of silver. There was some production of silver ores in 1929 from the Kingston, Fairview, Chloride and Lake Valley districts in Sierra County. The value of the 1929 production was \$582,000.

The unprecedented fall in the price of silver in 1929-30 has been very discouraging to miners of ores containing little else but this metal. The Value of the state's annual silver production seems destined to fall below the amount for 1929.

The principal uses of silver are in coins and as a medium of exchange, in jewelry and silver ware, and in photographic film.

Iron. - High-grade iron ores occur in a number of places. Some of the most important deposits are in the vicinity of Fierro, Grant County, near Fairview, Sierra County, and at Jones Camp, eastern Socorro County. The Fierro deposits are the only ones that have yielded an important production. Several hundred thousand tons of iron ore was shipped from these deposits in 1929 by the Hanover Bessemer Iron & Copper Company. New Mexico has iron ore reserves of considerable magnitude.

Iron is the, most important of the metals, constituting about 95 per cent of the total amount of all the metals produced in the world. It is utilized chiefly as cast iron, wrought iron, and steel, and it is used in making paints and chemicals.

Manganese. - Very little manganese was produced in New Mexico prior to the World War. The high price which prevailed at that time lead to the working of numerous deposits but none of these developed into large mines. In recent years an important manganese deposit has been developed in the Little Florida Mountains, Luna County. During the past five years this district has yielded about 13,000 tons of high-grade ore and concentrates. A large quantity of ore, much of it of milling grade, remains in the ground.

Deposits of manganiferous iron ore occurs at Boston Hill near Silver City, Grant County. From these deposits about 70,000 tons of ore was shipped to the Colorado Fuel and Iron Company, Pueblo,, Colorado, in 1929. The ore reserves at Boston Hill probably amount to several million tons.

Manganese is used in the manufacture of nearly all steels. It is also used extensively in dry batteries.

Molybdenum. - Valuable deposits of molybdenum ore occur in the Red River mining district near Questa, Taos County. They are owned by the Molybdenum Corporation of America. The ore is concentrated near the property. This is the second largest molybdenum mine in the United States, and as a result of its operations New Mexico ranks second among the states in molybdenum production. The output of this mine has an annual value of several hundred thousand dollars. Small quantities of molybdenum ore have been mined near Las Vegas, San Miguel County. Molybdenum deposits are reported in the Burro Mountains, Grant County. The Chino copper ores contain small quantities of this metal. In places molybdenum occurs associated with lead and vanadium.

Molybdenum is used principally in making molybdenum steel.

Antimony. - Antimony occurs in the Little Hatchet Mountains, Hidalgo County, the Cerrillos district, Santa Fe County, and in several other localities. Its main uses are in antimonial lead, bearing metal and batteries.

Arsenic. - Deposits of arsenic which occur in southwestern New Mexico are reported to be fairly large. This metal is utilized in insecticides, weed killers, stock dips, and wood preservatives.

Bismuth. - Bismuth ores occur in the San Andreas Mountains, Socorro and Dona Ana counties, in the Burro Mountains, Grant County, and at several other places in the state. A small amount of bismuth ore has been marketed from the northern part of the San Andreas Mountains. Bismuth is made use of in fusible alloys and in medicinal chemicals.

Radium. - Deposits of radium occur in the White Signal district, Grant County, and in the northwestern part of the state. Unusual radio-active minerals have been found near Petaca, Rio Arriba County. Radium is used by the medical profession and in luminous paints.

Tin. - Both placer and vein deposits of tin occur on the west side of the Black Range in Sierra and Catron Counties. This metal is used principally as a coating of other metals, as in tin cans; also in solder, babbitt, anti-friction metal, and as foil.

Tungsten. - Some years ago there was a small production of tungsten ore from the White Oaks district, Lincoln County, in the Picuris district, Taos County, and near Gage, Luna County. This metal occurs in small amounts in several other districts.

Tungsten is used in making steel alloys and particularly in highspeed steel tools. Its uses in electric light filaments and phonograph needles are common knowledge.

Vanadium. - This metal occurs in the state associated with radium and also with molybdenum, lead and copper. It is found in a number of districts, the best known being the Hillsboro district, Sierra County. Vanadium is used in manufacturing steel of unusual toughness and torsional strength. Vanadium steel is utilized extensively in automobiles and gun barrels.

Other Metals. - Several other metals occur in New Mexico. Among these are aluminum, cobalt, nickel, selenium, tellurium and Uranium.

Non-metallic Minerals

The non-metallic minerals of New Mexico to date have been of much less commercial importance than either the metals or the hydrocarbons, but they should play an increasingly important part in the utilization of the mineral wealth of the state. The list of the non-metallic minerals is long and a number of them occur in great quantities. Some, however, have been unable to overcome the handicaps of low price per ton and relatively high transportation costs to markets. New discoveries, changing economic conditions, and advances in methods of utilization will permit some of the non-metallic minerals to be utilized eventually on a large scale. Others may never attain more than scientific interest.

The New Mexico non-metallic minerals considered are as follows:
Abrasives, adobe, alum minerals, asbestos, barite, bentonite, building and ornamental stone, cement materials, chalk, clay and clay products, feldspar, fluorspar, fuller's earth, graphite, guano, gypsum, limestone and lime, lithium minerals, magnesite, meerschaum, mica, ocher, nitrates, petrified wood, potash, salt, sand and gravel, sodium sulphate, sulphur, turquoise, underground waters.

Abrasives. - In New Mexico are deposits of pumice, volcanic ash, and other minerals which can be used as abrasives, polishing powders, etc. Pumice occurs near San Antonio, Socorro County, and an especially large deposit is located near the base of Mt. Taylor, Valencia County. Volcanic ash is of frequent occurrence.

Adobe. - Many New Mexico buildings are constructed of adobe and perhaps in no other state is this material relatively so important as a building material. No statistics on its quantity and value are available.

Alum Minerals. - Deposits, which have not been utilized to date, however, occur north of Silver City on the Gila River, Grant County. Because of their location, transportation difficulties are unusually great. Alum minerals have been found in other places. Alum is used in dyeing, sizing paper, tanning skins, and clarifying water and other liquids.

Asbestos. - Small quantities of asbestos of the serpentine variety are found near Red Rock, Grant County. The main uses of asbestos are in fire-resistant cloth, heat-insulating materials, and building and roofing materials.

Barite. - Barite deposits of unproved extent occur in the Magdalena, Socorro Mountain, and Oscura Mountain districts, Socorro County, the Zuni Mountains, Valencia County, and in other districts. Some of these deposits are high grade. Barite is a common gangue mineral of New Mexico lead ores, and it occurs in places associated with fluorspar. In the not distant future it may appear in the list of minerals produced.

Barite is used as a filler in paper, rubber, cloth, linoleum, etc. Lithopone, of which it is the chief constituent, is utilized in paints, rubber tires and other rubber goods. Barium chemicals have various uses.

Bentonite. - Bentonite deposits are fairly numerous and the amount of the mineral available is great. A moderate future production is a possibility.

Among the important uses of bentonite are: as a bleaching agent in refining oils, as a paper filler, as a filler in soaps, and as a beauty clay.

Building and Ornamental Stone. - Marble has been quarried from time to time near Alamogordo, Otero County, and red sandstone in the vicinity of Las Vegas has been utilized as a building stone. Granite has been quarried in small quantities in the Sandia Mountains east of Albuquerque. Building stones have been quarried in several other localities.

The so-called ricolite near Red Rock, Grant County, is an unusually beautiful ornamental stone and has been utilized in a small way. Mexican onyx near Columbus, Luna County, may find a future market. Jasper occurring near Ancho, Lincoln County, is suitable for use as an ornamental stone. The cost of transportation to places of large demand is the chief handicap of New Mexico building and ornamental stones.

Cement Materials. - At many places in the state occur deposits of the rocks necessary for the manufacture of Portland cement, which

is used in making concrete. Whether cement made from them can compete successfully with that produced in neighboring states has not been determined.

Chalk.- Chalk is reported to occur in the northeastern part of the state. This mineral is used in paints, as a rubber filler, in putty, and as a cleaner and polisher.

Clay and Clay Products.- New Mexico has clay deposits of various kinds and great extent. Brick plants at several of the larger towns utilize local clays. The New Mexico Clay Products, Inc., Albuquerque, was an important producer of brick and hollow tile in 1929. The El Paso Brick Co. and the International Brick Co., both of El Paso, Tex., use New Mexico clays in the manufacture of their products. A number of deposits of fire clay occur in the state.

The value of New Mexico clay and clay products in 1929 was in the neighborhood of \$240,000. The clay industry of the state promises to expand in the next few years. Space will not permit the listing of the many uses of clays.

Feldspar.- Some of the New Mexico pegmatites may at some future time be worked for their contained feldspar. This mineral is used chiefly in the ceramic industries.

Fluorspar.- New Mexico fluorspar deposits are numerous and some of them are of moderate importance. Considerable fluorspar ore has been developed in the Sierra de Los Caballos, Sierra County, at the property of the Fluorspar Mines of America and at the Lida K property of the Southwestern Fluorspar Corporation.

In 1920 fluorspar produced in New Mexico had a value of \$101,000 but in 1929 it was much below this amount.

Fluorspar is used chiefly in the steel industry. Smaller quantities are used in the manufacture of opalescent glass and enamels and in making hydrofluoric acid.

Fuller's Earth.- This mineral occurs at Socorro Mountain, Socorro County. Its principal uses are for bleaching and clarifying oils, fats and greases of mineral, vegetable and animal origin.

Graphite.- Some years ago a deposit of graphite near Raton, Colfax County, was worked on a small scale. A number of other occurrences of graphite are reported. Crucibles, foundry facings and lubricants utilize most of the graphite production of the world.

Guano. - Caves containing guano in commercial quantities have been found in the Tres Hermanas Mountains, Luna County, and in various other sections of the state. A volcanic crater in the Jornada del Muerto yielded a moderate quantity of this fertilizing material. Guano deposits occurred at the mouth of the famous Carlsbad Cavern.

Gypsum. - A large area in New Mexico is underlain by gypsum, which occurs in thick beds of unusual purity. The important exposures of workable deposits occur in Bernalillo, Chaves, Dona Ana, Eddy, Guadalupe, McKinley, Otero, Quay, Rio Arriba, Roosevelt, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, Tarrant and Valencia counties. Gypsum also occurs as the "White Sands" in the Tularosa Basin, in Otero and Dona Ana counties. These sands, consisting of about 95 per cent gypsum, cover an area of about 270 square miles to an average depth of 20 feet.

Gypsum has been produced in moderate amounts at several places in New Mexico. In 1929 deposits in Chaves and Eddy counties were worked. The chief demand for gypsum is in the manufacture of plaster, stucco, wall board, partition tile, and plaster of paris.

Limestone and Lime. - Limestone had a fair production to its credit in 1929 from a number of localities. Part of limestone was burned to lime. An increasing future production seems probable.

Limestone is used as ballast when crushed, and in building construction. Lime is an important building material and is used in large amounts in the chemical industry.

Lithium Minerals. - A moderate production of lithium ore has been maintained for several years from unusual deposits near Dixon, Taos County. New Mexico ranks first among the states in the production of lithium minerals. These minerals are essential constituents of certain heat-resisting and shatter-proof glasses.

Magnesite. - A deposit of this mineral occurs near Red Rock, Grant County. Magnesite is used mainly in refractories.

Meerschaum. - Two important deposits of meerschaum are known in Grant County, some of the material being of high grade. The only use of importance is in the manufacture of pipes and cigar holders.

Mica. - Commercially valuable deposits of mica occur near Las Tablas and Petaca, Rio Arriba County, and Ojo Caliente, Taos County. They have been mined on a moderate scale for some years and have a promising future. Other mica deposits are known.

Mica is used as an electric insulator in dynamos, motors, telephones, spark plugs, etc. It is also used as a heat insulator, for glazing stoves, in radios and phonographs, and for decorative purposes.

Ocher. - Deposits of ocher occur in the Sandia Mountains, Bernalillo County, and near San Pedro, Santa Fe County. Ocher is used as a pigment.

Nitrates. - Small quantities of nitrates of doubtful value occur in caves and other places protected from the weather. Some of these nitrate minerals also contain potash. Their chief uses are in the manufacture of fertilizers and explosives.

Petrified Wood. - Petrified wood occurs near the Arizona border Valencia County, near Cerrillos, Santa Fe County, and other places. It is used to some extent for ornamental purposes.

Potash. - The most interesting of New Mexico's non-metallic mineral resources is potash. Diamond core drilling undertaken by the Federal Government has revealed the existence of enormous quantities of potash in Lea and Eddy counties. Much of the potash is in the mineral polyhalite which when pure contains only 15.6 per cent of potash. According to the U. S. Bureau of Mines these polyhalite deposits can probably be worked profitably in competition with the German potash salts.

In a relatively small area in Eddy County east of Carlsbad drill cores have contained appreciable quantities of the high-grade potash mineral, sylvite. If this mineral is present in the amounts suggested by the drill cores the deposits should be more valuable than the much larger polyhalite deposits. Early in 1930 the sinking of a shaft to be used in developing these high-grade deposits was begun by the United States Potash Company.

New Mexico potash may soon replace in a large part the imported German potash salts. In 1928 the value of potash salts imported into this country was \$22,000,000.

About 90 per cent of the potash consumed in the United States is used in the manufacture of fertilizer and for direct application to the soil. The balance is nearly all used in the chemical industry.

Salt. - Beds of salt many hundreds of feet in thickness underlie thousands of square miles of Lea, Chaves and Eddy counties. The salt in these deposits amounts to perhaps 15 trillion tons. Numerous salt lakes in New Mexico have deposited a part of their salt content and this is made Use of in a small way. Crater Salt Lake, which occupies a volcanic crater in Catron County, is worthy of special mention. Important salt lakes occur in Eddy County and near Estancia, Torrance County. Salt taken from New Mexico deposits is used largely by stock on the ranges.

The largest single use of salt is in manufacturing other sodium salts. Other important uses are for culinary purposes, in meat packing and curing, and in refrigeration processes.

Sand and Gravel. - These are of wide occurrence in New Mexico. They are being used in steadily increasing amounts in building construction, on the highways and in railroad operations. Their value in 1929 was several hundred thousand dollars.

Sodium Sulphate. - In Dona Ana County are lake deposits of sodium sulphate. This mineral is used in dyeing, tanning and in the textile industry.

Sulphur. - Sulphur deposits were worked at one time near Jemez, Sandoval County, with indifferent success. Sulphur also occurs in Guadalupe County.

Most of the world's sulphur production is used in making sulphuric acid. Smaller amounts are used as a fertilizer, in insecticides, and in vulcanizing rubber.

Turquoise. - This gem mineral is of much historical interest as it was probably mined by the Indians before the arrival of the Spaniards. The chief deposits are in the Cerrillos Hills, Santa Fe County, and the Burro Mountains, Grant County. They were worked extensively some years ago. Turquoise deposits also occur in the Little Hatchet Mountains, Hidalgo County, and the Jarilla Mountains, Otero County. The demand for this gem mineral has increased recently, and this will probably result in increased activity at some of the New Mexico turquoise workings.

Underground Water. - Artesian wells and springs are properly considered under the head of mineral resources. In the Pecos Valley thousands of acres of land are irrigated by artesian wells, and this artesian area is one of the greatest in the country. Artesian wells of importance have been drilled in various other sections.

New Mexico has many famous springs. Bathing in the waters of some of these is considered to be highly beneficial for rheumatism and other ills, and the waters of others are reputed to be of marked medicinal values. Some of the best known springs are located near Ojo Caliente, Taos County, Hot Springs, Sierra County, Faywood, Grant County, Jemez, Sandoval County, Carlsbad, Eddy County, and Socorro, Socorro County,

Hydrocarbons

The hydrocarbons which play an important part in the mineral production of New Mexico are coal, petroleum, natural gas, and natural gas gasoline. Carbon black, oil shale and bituminous sandstone, though not of commercial importance at present, are considered.

Coal. - New Mexico in 1929 produced 2,622,700 tons of coal having a value of \$8,314,000. The Raton district, Colfax County, is the most important in the state on the basis of production, followed by the Gallup district, McKinley County. Ordinarily about 60 per cent of the state's coal production comes from the Raton district. The chief producing properties in this district are the Swastika mines of the St. Louis Rocky Mountain & Pacific Co. at Raton and the Stag Canyon mines of the Phelps Lodge Corporation at Dawson. In the Gallup district the Gallup American Coal Co. is the chief property.

Coal from the Raton district is of bituminous grade and in addition has good coking properties. Gallup coal, though classed as sub-bituminous, is a very satisfactory fuel.

The smaller fields include the Los Cerrillos field in Santa Fe County, the Carthage field in Socorro County, and the La Ventana field, Sandoval County. The Los Cerrillos field has supplied for many years a moderate tonnage of anthracite coal. Carthage coal, in addition to having an unusually high heat value, is a coking coal.

The coal resources of New Mexico have been estimated to be in the neighborhood of 192 billions of tons, or enough to last for 70,000 years at the present rate of utilization.

The outlook for coal in New Mexico in the immediate future is not encouraging. Petroleum and natural gas have supplanted it in many places and their encroachments are steadily increasing. Later, when the available amounts of oil and gas diminish the coal industry will probably enjoy another period of prosperity.

The uses of coal are too well known to be given here.

Petroleum. - Crude petroleum, also known as oil, was first found in New Mexico in an amount sufficient to attract interest at the Brown well near Dayton, Eddy County, in 1909. The earliest commercial oil well was drilled on the Hogback structure in San Juan County in 1922 and the Artesia field, the first to become productive in southeastern New Mexico, was discovered in 1924.

The Artesia field in Eddy County was the largest petroleum producer in the state for several years. Since its discovery an extensive drilling campaign has been conducted in southeastern New Mexico, and several additional pools have been found. The Hobbs field in Lea County, discovered in 1928, is a major oil field and has given New Mexico for the first time marked prominence as an oil state. The potential production of the Hobbs field on August 31, 1930, was about 415,000 barrels per day. Drilling during the balance of 1930 will undoubtedly greatly increase the possible petroleum yield. The proration agreement adopted in July, 1930 will keep the actual production to a small fraction of the amount that could be obtained, however.

Important oil developments have occurred in San Juan County. The chief producing fields are the Rattlesnake, Hogback, and Table Mesa, the Rattlesnake field being the most important. Small quantities of petroleum have been obtained near Bloomfield. The petroleum of the San Juan fields is unusually high grade. It has a gravity of about 600 Baume and contains about 75 per cent gasoline. This oil has been used in automobile engines as it comes from the wells.

Other fields in southeastern New Mexico include the Lynch, Jackson, and Jal fields in Lea County, the Maljamar field in Lea and Eddy counties, and the Getty field in Eddy County. The Getty field produces a heavy oil that may be used in making oiled roads.

In McKinley County the Hospah field has promise, and a number of small wells have been brought in near Seven Lakes.

Petroleum and its products, including natural gas, produced in New Mexico in 1929 were valued at approximately \$2,500,000. Petroleum produced in 1930 will have a value several times greater than in the preceding year, and it should continue to increase. Petroleum will probably be New Mexico's most valuable mineral product in 1930 and for a considerable subsequent period. Doubtless other oil pools in New Mexico await discovery.

The chief products from petroleum are gasoline, kerosene, fuel oil, gas oil and lubricating oil, but hundreds of other products are made from it.

Natural Gas. - Important gas fields have been developed in San Juan County, these including the Ute dome, Kutz Canyon and Huntington Park fields. One of the wells at the Ute dome has an open-flow capacity of 72,000,000 cubic feet per day.

The Southern Union Gas Company is constructing pipe lines which will bring gas from the Kutz Canyon field to Albuquerque, Santa Fe, Las Vegas, Belen and intermediate towns.

A large gas field with an area of approximately 100 square miles has been developed near Jal, Lea County. The open flow capacity of the wells ranges from 5,000,000 to 70,000,000 cubic feet per day. The El Paso Natural Gas Company delivers gas to El Paso, Texas from the Jal field through a pipe line 214 miles in length. In the summer of 1930 the consumption was approximately 12,000,000 cubic feet per day.

Many of the oil wells in Lea County are also large gas wells.

Pecos Valley towns are supplied with gas from the Artesia and Maljamar fields.

A notable increase in the natural gas production of the state seems assured.

Natural gas is used chiefly as an industrial and domestic fuel.

Natural Gas Gasoline. - For several years a part of the gas produced in the Artesia field, Eddy County, has been treated for the extraction of the contained gasoline. Increasing quantities of natural gas gasoline from various fields should be marketed.

Carbon Black. - New Mexico gas may be used at some future time for the manufacture of carbon black, which is used in automobile tires, printers ink, and paints.

Oil Shale. - In the vicinity of Scholle, Tarrant County, a thin bed of high-grade oil shale has been discovered. Crude oil can be obtained from oil shale by distillation.

Bituminous Sandstone. - A deposit of asphaltic sandstone occurs near Santa Rosa, Guadalupe County. Near Gallup, McKinley- County, are sands impregnated with heavy oil and oil residues. Bituminous sandstones are used in places as road material.