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# The History of Mining in Mexico and Its Economic Development

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FLANDERS & CO.,  
20 Broad St., New York

Reprint from the Journal of the American Bankers Association  
July, 1916

Wm Simble and Co. 18

# The History of Mining in Mexico and Its Economic Development

Divided into Four Main Periods, the Last of Which, the Revolutionary, Began in 1911—Greatest Development of Mining Took Place under Porfirio Diaz—A Country Fabulously Rich in Natural Resources.

By T. W. OSTERHELD

[Note—Values given in this article are in terms of Mexican silver pesos.]

C ECIL RHODES, the Empire Builder, said of Mexico: "I am not blind to the unison of opinion, expressed by scientists and experts, that Mexico will some day furnish the gold, silver and copper of the world that will build the empires of to-morrow and make future cities of the world veritable new Jerusalems."

At that time the mines of gold, copper and the base metals were incident to the silver production, Mexico's premier mining industry. Since then the great copper mines of Cananea, Nacozario, Boleo, under the leadership of the Cole-Ryan interests, Phelps Dodge and Rothschilds, have placed Mexico in the second rank of copper producers of the world. At El Oro, under Haggin, Hearst, Salzberg and Fournier, Mexico has become one of the great gold producers. Oil abandoned by Mexico capitalists, through the persistent struggles of Doheny Pearson & Son, and Deganahl, on the Panuco River, has become so great a field as to arrest the attention of the world. To these great pioneers, Anglo-Saxons, French and German, Mexico owes her great mining development.

## The Colonial Period

Let us treat first the Colonial or Spanish period of mining in Mexico (1537-1821). The colonial mint record of this period is: Silver, 2,082,260,657.44 pesos; gold, 68,778,411; copper, 547,893.37.

For three hundred years the mines of Mexico were the chief sources of silver of the world. Their richness made Spain an empire; with their loss came its decline. Up to the middle of the nineteenth century the greater part of the circulating medium of Europe came out of the silver mines of Mexico, and despite the inferior methods of mining overshadowed in production all other countries. With the opening of the great mines of Tasco, of the state of Guerrero, in 1522, through Hernan Cortez, the history of mining was inaugurated by the white race in Mexico. Carried away by the rush for gold found in Tenochitlan (City of Mexico), as well as in the temples of the Aztecs, the Spanish pioneers sought gold everywhere, forgetting all dangers, suffering every conceivable hardship, conquering immense areas of land and losing all through the same cause.

The conquerors of Mexico were great miners, and so changed the destiny of the natives at once by their activity in discovering and opening mines of silver and

gold everywhere. From Tasco came the opening in 1544 of the mines of Santa Barbara, Parral, Chihuahua as gold mines, which afterwards changed into silver at the hundred-foot level. In 1546 the mines of Zacatecas were found, quickly followed in 1548 by the discovery of the mines of Guanajuata in the valley of Rio de Las Palmas. At the same time the Bolannos mines of Jalisco were discovered, as well as those of Los Tajos de Panuco Zacatecas. In 1550 the main vein of Guanajuata, called the Veta Madre, was begun, and in April of the same year the mines called Rayas and Mellado were developed. Up to 1803 this district had given \$5,020,750, and together with Zacatecas and Catorce had produced half of the silver mined in Mexico. The production of this district may be safely put down to over \$1,000,000,000.

In 1551, near the capital of Mexico, the first work was begun, at Real de Monte, district of Pachuca, state of Hidalgo, which has developed into one of the greatest producers of silver in Mexico. In 1552 Genio del Vazquez del Mercado, in striving to find gold and silver, discovered a heavy deposit of iron, at Cerro del Mercado, near Durango, which has proved to be one of the largest iron deposits in Mexico. This was followed in 1555 by the locating of the mining camp of Sombrereta, state of Zacatecas, giving the first impulse to mining in that state, the output of which, from 1548 to 1810, has been calculated at \$588,041,956. From 1810 to 1823 a further \$200,060,000 was coined, and up to 1832 this state alone had produced \$656,043,335. A great event in 1557 was the discovery of the patio process, by Bartolome de Medina, in connection with the mines of La Purisima. Prior to this all ore had been crudely smelted. Subsequently quicksilver took the place of copper salts to produce amalgam.

During the year 1574 much work was done at Charcas, state of San Luis Potosi, in opening many small mines; none of which, however, reached a greater depth than 125 meters. Incidentally considerable salt deposits were found and utilized at this point.

The great mines of Mapimi first came into prominence in 1598. Since then this state has become a great producer of gold and silver, and these mines in particular have since become the property of German interests, who for many years have managed them with extraordinary skill. San Luis Potosi again contributed, by the discovery in 1622, at Guadalazar, another large sum of silver to the world's output. The Botopilas mines, of the state of Chihuahua, in 1632 were made known to the Spaniards and have since become one of the largest producers of metal, leading to the development of the entire state. More than 23,000,000 pesos have been produced by the mines of this camp, and while the adjacent camps have produced considerable native silver, no other has been so celebrated in this respect.

Why single out Deganahl

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The principal vein in the Candelario mines, district Cusiguirachi, Chihuahua, was then developed, resulting in an extraordinary bonanza. The product of this mine was estimated, in the latter part of the eighteenth century, at 6,000,000 marks per year and rose to 18,000,000 marks of silver, until in 100 years this camp had produced over \$35,000,000.\*

Santa Eulalia, Chihuahua, is the next event prominent in mining history. In 1703 the mine El Caballo, in conjunction with four other mines, produced such great quantities of silver that at the beginning of the eighteenth century this district was considered the richest mining district in the world. The richness of this mineral district may be gauged by the output from 1705 to 1737 alone, in which there was reported an average production of 49,000 marks of pure silver, representing a total output of \$55,959,750. Again, from 1738 to 1761, we find reported silver to the amount of \$29,140,363. The richness of these mines can hardly be overestimated, because of the unreported amounts of silver taken out secretly to avoid taxation; in consequence of which the authorities could never give a close estimate.

The state of Sonora began production in 1725, when the mines of Planelas de la Plata, district of Magdalena, were opened, followed by the districts of gold and silver ores of Minas Prietas, district of Hermosillo.

By this time the great district of Parral, which had been discovered in 1675, had developed into large camps and gave impulse to many other discoveries in the state of Chihuahua. Again, it must be said that this district owes much of its prominence and activity to Germans, Americans and English. In 1759 came the finding of a further rich mine in Real de Monte, through a Spaniard, Ramero de Terreros, who gave to Pachuca the initial start which to this date has made Pachuca world-famous as a silver production camp. In 1760 the Valenziana mines in Guanajuata became, through Obregon, the greatest mine of silver known to this continent, producing between 1766 and 1826 more than \$225,935,736. This district became a center of great mining activity and is of great interest internationally because of the many interwoven interests of English and American capital. This century appears to have been the great silver bonanza age for the Spaniards. The bonanza of Real de Monte resulted in an output of over \$15,000,000 by 1781. In 1773 the mines of Catorce and San Luis Potosi were opened by Sebastian Coronada and Banabe Antonio de Zapada, yielding in all more than \$14,000,000 by 1782. La Purisima Concepcion mine of the same state began working in 1780, and in 1793, owing to the revolutionary tendency of the natives, the patio process, which had exacted many lives, was modified by the introduction of horses and mules to do the work formerly done by natives.

During this period, also, the mines of Tlalpujahu, state of Michoachan, under the ownership of Juan de la Borda, had yielded an enormous amount of silver. From 1743 to 1751 the output of one mine alone was \$18,000,000. Attention is called to this district because of

\*Ramerez, "Riqueza Minera de Mexico."

the subsequent development of the great group of gold mines of Dosestrellas and the mines of El Oro, two miles distant, which owe their development to the initial discovery in Tlalpujahu.

At the beginning of 1800 the Spaniards had reached the zenith of their wealth and productive capacity. The yearly production of this period was about \$27,000,000 up to 1810, when the War of Independence began and production fell to less than \$5,000,000 per year, until the expulsion of the Spaniards in 1821. During this period of the War of Independence many mines had been abandoned and allowed to fill up with water, until English capitalists were induced by liberal laws to begin the rehabilitation of the principal mines of Mexico.

#### The Independence Period

The Independence or British period of mining in Mexico dates from 1822 to 1875. The mint record of this period is: Silver, 797,055,080.71; gold, 47,327,327,383; copper, 5,272,855.93.

The national congress of the new republic, which assembled in Guanajuata in 1823, decreed a mining law which allowed foreigners to enter into the development of the mines of Mexico and abolished many of the prohibitory taxes and Spanish monopolies which had prevented, up to that date, a vigorous development of all the mines. About this time English capitalists began to invest heavily in the mines of Mexico, one of the earliest companies being the United Mexican Mines Association, which owned large mines in many states and continued operations up to 1907, their business comprising a period of over eighty years. They owned the great mines of Guanajuata, of the Veta Madre vein. They opened and developed many mines in the state of Mexico, the mines in Zacatecas Sombuerta, in Chihuahua, Jesus Maria, in Oaxaco, Hidalgo, Michoachan, in the state of Mexico, in Guerrero and the mines of Coronella; while in Mexico City they established a refining plant and were put in charge of the minting operations.

Another great company was the Anglo-Mexican, which became the owners in Guanajuata of the great Valenciana and Mellado veins. At Zimapam many mines were developed by them, as well as at Catorce, in conjunction with the Real de Monte Company of Hidalgo. They developed the mines in many districts of the state of Michoachan, and were closely affiliated with the Tlalajuhua Mining Company, which opened over eighty-two mines in the latter district and seven mines in El Oro, which have become the most important gold producers of Mexico at the present time.

By 1828 eight large English companies were operating with a capital of £3,000,000, two American companies, one of Baltimore and another of New York, with very small capitals with mines at Temascaltepec and a German company of Elberfeld, capital approximately \$128,000, mining at Temascaltepec, Los Arcos, state of Mexico, and at Angangeo, near Zitacuaro, state of Michoachan. The English mines quickly supplanted their Spanish predecessors, often acquiring mines with them as associates, oftener without. To these great

English miners is due the development in Mexico from 1820 to 1875. They introduced machinery and new methods of mining. Distances and hardships never discouraged British capital and perseverance. From Vera Cruz to Pachuca, over the mountains and valleys, pumping machinery was transported by men and horses. At Sultepec and at El Oro, the great gold camp, machinery was brought from St. Louis, Mo., by wagon and cart, thousands of miles, as well as at Guanajuata, state of Guanajuata, for the pumping out of those mines. Many of the first British pioneers and speculators were thus ruined by the heavy transportation charges and mismanagement of their properties by the men sent out. Their successors, however, reaped the beneficial results of these expenditures, and throughout the republic they replaced the crude methods of the Spaniards by machinery and the best kind of hydraulic apparatus. Wherever Spaniards or Mexicans had worked these companies replaced them and discovered new mining territories.

In order to follow fully this period of the development of the mines of Mexico, as well as to make clear the following narratives, the mines are classified into eight groups. They are nearly all located near the top of the western slope of the Cordilleras. The first of these groups has been very productive, and embraces the districts contiguous to Guanajuata, comprising the mines of Valenciana, Villalpando, Cata, Mellado, Laluz, those of Charcas, Catorce, Aguascalientes, Aseatos, Ibarra, Fresnillo and Sombrereta. The second group comprises the mines situated west of the city of Durango as well as those of Sinaloa. They include the gold mines in the vicinity of Altar, discovered in 1834 and 1844. San Ildefonso de la Cieneguilla, San Francisco, San Dimas, Guarosamay and many others, such as San Jose de Mulatos, northeast of Alamos, due west of the Jesus Maria mine in Chihuahua and Guanacevi. The third group is that in the northern part of Mexico, embracing the mines of Chihuahua, Cusiguiriachi, including such mines as those of Parral, San Eulalia, Botopilas, and extending between the 27th and the 28th degree northern latitude. The fourth and fifth groups are found in the northeast of Mexico and are formed by the mines of Real de Monte, Santa Gertrudes, La Blanco of Pachuca, Zimapam, the great mines of El Oro, Tlalajuahua, Temascaltepec, Anganeo and Tezhuatlan Copper of the state of Puebla. The Bolannos mines of Jalisco, the group of mines near Ameca Ameca and Hostatipaquillo may be considered the center of the sixth group. Tasco, Guerrero and the great mines of Oaxaca, including the entire region to the isthmus of Tehuantepec, with Tabasco, make up the eighth group.

These eight groups, into which the mining districts were divided during this period of development, occupy a space of twelve thousand leagues, one-tenth of the whole republic of Mexico prior to the war of 1848. Laluz of Guanajuata was opened about 1840, and from 1843 to 1847 came into bonanza, becoming one of the most famous districts of Guanajuata. It is at the present time one of the best producers of that state.

During this period mines previously discovered were developed, and much new territory was added to the mines of Mexico, especially in Durango, Chihuahua and the state of Mexico. During the French intervention, the mining development of Mexico did not make much progress, though the French engineers made a great deal of headway in the then established districts, especially in the development of the great opal mines, at Queretaro.

To a German, Jacob Kuechler, belongs the honor of the first exploitation, in 1866, of coal at Sabines, Coahuila, which subsequently became great coal mines. The anthracite mines of Sonora came into notice about this time, though developed at a much later date. With 1870 begins the development of the rich gold veins of Real del Castillo, in Lower California, which, in 1873, was followed by the discovery of cinnabar and other quicksilver ores at Huitzuco, in the state of Guerrero.

Briefly stated, in the Colonial or Spanish period, 1537 to 1821, there was produced silver to the amount of 2,082,260,657, gold 68,778,411, copper 542,892, making a total of 2,151,581,961.

During the Independence or British period, 1822 to 1875, there was produced silver to the amount of 797,055,080, gold 47,327,383, and copper 5,272,856, making a total of 849,655,320. During this latter period the mining laws were greatly modified. In 1822, reductions took place in taxes, from nineteen per cent. to two per cent. of the *ad valorem* value of the ores. Coinage fees were reduced to twenty-five cents per mark of silver. From 1822 to 1828, two new mints were added to the seven previously created by the Spanish government.

\*In 1857 the different states were empowered to create their own mining laws, which, however, were so damaging to the mining industry of Mexico that in the latter part of 1883 the Federal Government again assumed control of all the mines, and upon recommendation of an expert commission reformed the mining laws of Mexico.

#### The International Period

The Republic or International period mining in Mexico runs from 1875 to 1911. (British, American, French and German domination.) Coinage record of this period: Silver, 757,507,434; gold, 104,181,210; copper, 1,321,548; nickel, 5,437,714.25; bronze, 1,241,418.90. Total, 1,537 to June 30, 1912, as per Mexican authorities. Gold, 220,287,004; silver, 3,636,823,171.91; copper, 7,137,287.73; nickel, 5,437,714.25; bronze, 1,537,435; total, 3,871,243,213.

With the presidency of Porfirio Diaz was inaugurated the greatest development of mines and mining in Mexico. From 1875 to 1880 Mexico produced in silver and gold approximately 103,000,000, owing to the rapid increase of foreign capital investments. By 1878, the United States had become, through the development of its own mines and varied experiences of its miners and engineers, so powerful that they were in a position to undertake a prominent part in the development of the Mexican mines and the shaping of the future history of

\*Martinez E. Baca, "Resenna Historica de la Legilacion Minero de Mexico."

that country. In 1878, Nestor Arreola and Purcell of Saltillo established the great camp of Sierra Mojada, which brought in its train the development of the state of Coahuila and of the Laguna districts. The copper mines of Concepcion del Oro, the Torreon Smelter, Monterey Steel and Iron Company, and the groups of mines owned by Milmo Kelly's Madero's and others are traced directly to the activity developed by this silver discovery.

Edwin Ludlow in 1884 inaugurated a most interesting period in Mexican mining by undertaking, for an American company, the first successful borings of the coal deposits in the upper cretaceous (Lamarie) formation. To this engineer and his company are due the great coal and coke industry of Mexico, and the subsequent results in the building up of her iron and metallurgical industries. By 1899, this engineer and his associates had fully inaugurated the exploitation and development of the coal basins of Fuente, Sabinas and Las Esperanzas, Coahuila. The production, shown by the export figures, in 1895, is placed at 61,688 metric tons; from 1895 to 1904, 5,298,894 tons; and in the year 1907 the production alone was 1,265,790 tons, with over 22,280 tons of coke.

Copper had been mined in Mexico in small quantities from the beginning of time until the great house of Rothschilds of Paris, in 1885, began the development of the copper mines of Boleo, San Rosalia, Lower California, subsequently purchasing the Inguran mines, state of Michiachan. The tonnage of copper in 1879 was calculated at 400 metric tons and had reached by 1910 3,809,246 metric tons, making Mexico rank second as the world's producer of copper. This was followed by the copper development in 1890 at Concepcion del Oro, state of Coahuila, and several years later by the opening of the mines of Cananea, district of Arispe, state of Sonora, and the Pilares mines in the district of Moctezuma. In 1895 the Mexican copper output was only 11,620 long tons. Ten years later it exceeded 55,000 tons, a growth of practically over five hundred per cent. in a single decade, to which Cananea, Moctezuma and Chihuahua mines, and Tezuitlan, Puebla, were the greatest contributors.

By July, 1906, the mines in Mexico were as follows: Copper, 956; iron and copper, 209; copper, lead, 25; silver, copper, 773; silver, copper, lead, 310; gold, silver, copper, 1,314; a total of 35,087 copper mines and mines of cupiferous values. Through protective tariff legislation in the United States in 1890, by the McKinley bill, the silver lead smelting industry was established in Mexico. It grew up into one of the most powerful mining industries of Mexico, by the establishment of smelters in Monterey, Aguascalientes, San Luis Potosi, Villadenna, and subsequently Chihuahua, Torreon and Durango. Mr. M. Elsasser, a mining engineer, and Corkson & Co., of London, in 1893, began the building up of the antimony industry in Mexico. Smelting of antimony was inaugurated in the republic in 1902, and while the exportation of the metal had dwindled into insignificance, by 1910 the output of antimony metal had attained such

proportions as to put Mexico in the premier position among the world's producers of this metal.

The introduction of cyaniding, about 1895, for gold and silver through the MacArthur-Forest cyanide process, in a great measure replaced the patio process and made possible the great advances in mining still going on in Mexico. Its first practical test was given through Carson, under the management of the Haggin-Hearst interests, at El Oro, to whom the credit of this development must be given and the subsequent rise of this camp. During the period of thirty-one years, up to 1909, Mexico produced \$1,000,000,000 of gold and the gold increase rose from 13,000,000 per year to 62,271,000 during the year 1908 to 1909.

At Guanajuato, under the leadership of American capitalists and J. B. Empson, the practical extraction of the gold and silver ores of that camp were fully demonstrated, and at the same time Santa Gertrudes Pachuca obtained such results both in cyaniding and fine crushing as to give a renewed impulse to the mining of silver in both camps.

During the next ten years the petroleum industry came to the notice of American and English oil experts and received renewed impulse through them, after various failures by others, to such an extent that it is easy to predict that Mexico very soon will outrank every other country in the production of fuel oil. Prior to 1900, under the name of *chapopote*, fuel oil was known extensively to many. As early as 1872 John C. Spear, on the geology of Tehuantepec, had already indicated the existence of oil near the River Coahuacan. Prior to 1900 attempts were numerous. Much had been discovered and worked on a limited scale, but the great success of oil in Mexico must be ascribed to the first successful efforts and work done by Doheny and the Mexican Petroleum Company in February, 1901, when they began the preliminary exploration in the neighborhood of Ebano, in the limits of the states of San Luis Potosi and Vera Cruz, simultaneously with the work of the engineers of Sir Wheetman Pearson & Sons.

On December 24, 1901, the federal government, desiring to stimulate exploitation and exploration of oil, issued a decree giving permission to exploit the free federal lands, issuing patents and privileges of such a character as to encourage at once a start and an immense development of this oil industry. In 1902 the great English company, S. Pearson & Son, now known as the Anglo-Mexican, began work on the Isthmus of Tehuantepec, near Haltipan, San Cristobal, also extending the work to Sayula. Other geological and prospecting work was continued by this company through 1905 and 1906 at Sarlat and Tuxpan, as well as at Tumbadero, Tanguijo and Cerro Viejo. In 1905 they built the first refinery at Minatitlan. Subsequently this company opened wells in the region of Cubas or Furbero, Canton de Papantla. It is impossible to give sufficient credit to these two companies, their engineers and associates, who have expended immense sums of money in exploitation for oil, and who have in consequence built up an industry in Mexico, the

efficiency and output of which will soon rank first in the world.

The period of 1900 to 1910 brought the greatest progress in the utilization of water-power and electrical transmission in Mexico. At Necaxa, 171 miles from El Oro, a great power plant has been established of over 100,000 horse-power capacity, of which El Oro is consuming over 30,000 horse-power to run their machinery. This same company has successfully inaugurated electrical power in Pachuca, Hidalgo, and many mines are effecting great savings by employing this power.

In Guanajuato, through the enterprise of Americans, the camp has taken on a new lease of life and many mines which were unproductive have become, through this utilization of water power, effective producers. These new developments have also brought activity in Oaxaca, Chihuahua, Durango, Zacatecas, Temascaltepec and Sultepec.

#### The Revolutionary Period

The revolutionary or transition period of mining in Mexico began in 1911—and still exists. Coinage, estimated, 7,000,000; paper currency, 500,000,000.

In the latter part of 1910 the revolution in Mexico broke out. The most striking feature of Mexican mineral production at the outbreak was the increase in the output in the base metals and non-metallic mineral substances. Raymond and Ingles pointed out that the history of four centuries of mining on this continent emphasizes a great principle of economics, namely, that while mining in new regions is originally inspired by the desire to obtain precious metals, no permanent industry is established until mining of base metals and of the bulk minerals, especially coal and oil, is begun. It may be pointed out further that internationalization of the mining industry in Mexico will not become fully effective until the productive groups are so strong as to be able to dictate the proper laws, governing the mining of base metals and non-metallic substances in the republic.

Up to the latter part of 1912 the revolution had very little effect on mining in Mexico. The eleven months in 1912 show exportations of gold 49,000,000, copper 35,200,000, silver 89,500,000, lead 6,100,000, zinc 930,000 pounds and antimony 1,890,000 pounds. After this period almost a complete cessation of mining took place. Minting was almost stopped and the country had recourse to the issuance of paper currency. Two indus-

tries, however, still maintained a strong activity—copper and oil. Oil by 1907 had reached the production capacity of 1,000,000 barrels and the output continued to rise rapidly, so that in the year 1913 the Mexican exports reached 16,762,904 barrels of crude oil, and its development continued through every phase of the revolution. No fewer than 164 companies had come into existence by 1913 to develop oil, their combined capital exceeding \$300,000,000. Through 1915, 18,675,027 barrels were exported, with an estimated production of about 24,500,000 barrels, and at the end of last year, or thereabouts, the great well of the Mexican Petroleum Company was brought in with a reported flow exceeding the entire daily output of the whole state of California. The oil industry in Mexico has been almost entirely developed by American and British companies and both methods and appliances are as a rule American, as are most of the men in charge of the operations.

#### The Pressure of the Economic Units

The recognition by the American government of General Carranza inaugurated a new mining phase in Mexico. A careful review of the economic history of mines in Mexico proves conclusively the almost complete internationalization of that industry in Mexico. It may be stated, though not guaranteed to be true, that American productive capacity controls about thirty-five per cent. of all mining enterprises, British thirty-three per cent., French, German and Dutch twenty-three per cent., and the remainder Mexico and other countries. The political revolution in Mexico will have far-reaching effect on the economic future of mining and the international groups. A further contributory factor must be the great war in Europe.

The political boundary of the United States and Mexico is the Rio Grande River, but it is quite apparent that the economic demarcation of the two countries is the Tropic of Cancer. The pressure of the economic masses, the *Drang der Masse* as the Germans so effectively defined it, has become so persistent and vigorous as to make imperative the entire revision of the laws governing mining in Mexico; and should the governing units in the United States and Mexico not be able to unite on a basis satisfactory to the productive elements of both countries they may find in the epigram of Madame Pompadour's "*Après moi le Deluge*" ("After me the deluge"), a probable ending of their endeavors to bring this revolution to its closing period.



