

Huacana, with copper.
 Inguaran, with silver.
 Joya, with silver.
 Nucupétaro, with copper.
 Ocurio, with coal.
 Oxumatlan, with native or sulphureous silver and galena.
 Puerto de Cuto, with copper.
 San Francisco del Oro, with silver.
 San Andrés de Ucares, with beds of sulphur, caparosa and alum.
 San Chiqueo and San Pedro Jorullo, with copper.
 Sierra Cucha, with silver.
 Truchas, with silver lead ores.
 Tequicheo and Tuzanta, with silver.
 Tlalpujahua, with gold, silver, iron and gray antimony.
 The Tuxpam mountains, with iron.
 Tzirate, with silver.
 Rio Zacatula, with coal.

The system of reduction which is employed is that of amalgamation, and numerous establishments are found for the purpose scattered throughout these districts.

Of all the Mining districts above mentioned, those of Tlalpujahua, Angangueo, and Inguaran, are those in which operations, are well established. The mineral district of Tlalpujahua in the district of Maravatío, contains rich veins of gold and native silver, besides other forms, such as sulphureous silver, ruby silver of a dark red color, iron pyrites, brown iron and gray antimony.

In the Angangueo mines situated in the district of Zitácuaro, they work silver, copper and iron.

At Inguaran, situated in the district of Ario, the special products are, iron ore, oxides of iron, clays, and specular iron.

In the neighborhood of the of Volcano Jorullo, between the Hacienda of Puruarán and the mountains, are found abundant deposits of volcanic as well as basaltic and porphyritic lavas.

The copper veins are found in the igneous and metamorphic rocks, the metal presenting itself in the forms of enormous irregular masses or pockets, without any particular dip, and of the most variable character. At other times it is found in true fissure veins with clearly determined walls and a well defined direction. The metal is found in these veins mostly in the upper and lower levels, but rarely found at a moderate depth.

The innumerable and powerful veins, have a matrix of ferruginous quartz accompanied by galena, carbonate of lead, blende and common pyrites. The assays of these ores vary from 14 to 86 per cent of copper and from a few ounces up to one mark of silver per English ton.

In the south eastern part of the State, veins are found containing galena, blende and carbonate of lead, but with very little copper. There are more than 70 mines and tunnels opened but only a few of these are at present worked.

These ores are mostly reduced by reverberatory furnaces, but the process requires so many successive operations that it becomes very slow and imperfect and the establishment of modern works is urgently required.

The expenses incurred on these ores can be estimated as follows:

Expenses of extraction.....	\$ 5 00
Freight to the smelter.....	0 50
Cost of reduction.....	3 50
Freight of copper to Santa Clara.....	0 75
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	9 75
Profits.....	6 45
	<hr/>
	\$ 15 20

These calculations are based on the carga of 300 pounds.

STATE OF GUERRERO.

This important State of the Republic is one of the richest and at the same time one of the least known with respect to its

mineral riches. Its mountains, throughout the whole State, hold enormous treasures, which, when properly worked will produce immense sums of money.

The most interesting districts of the State of Guerrero are: Tasco, Tehuilotepic and Julianthla, with veins of galena carrying more or less silver, ruby silver, sulphureous silver or black sand, an abundance of yellow and black blendes, pyrites, native silver, gray and yellow copper and gray antimony; Tepantitlan, with gold and silver; Ajuchitlan, with gold, silver, copper, lead and cinnabar; Huitzuc and Pregones, with cinnabar. The gold, silver, iron, copper, lead and cinnabar, are found in many places throughout the State, and in some parts, coal beds are known to exist.

The mines already known in the State, amount to 461, and are distributed as follows:

202 in the District of Alarcon (Tasco), silver, lead, copper, and magistral.

127, in the District of Hidalgo (Iguala), silver, lead and cinnabar.

21, in the District of Aldama (Teloloapam), silver, gold, copper, lead and cinnabar.

1 in the District of Guerrero (Tixtla), silver.

17 in the District of Bravos (Chilpancingo), silver, iron and coal.

3 in the District of Morelos (Tlapa), silver and copper.

1 in the District of Allende (Ayutla), coal.

4 in the District of Tabares (Acapulco), gold, iron and copper.

2 in the District of La Union, coal, copper with silver and argentiferous galena.

1 in the District of Chilapa, silver.

92 in the District of Mina (Coyuca), gold, silver, cinnabar, copper and lead.

According to Don Manuel Anda, there are 4 mineral districts in this magnificent State: Ixtlan, Villa Alta, Teoxomulco and

Peras. The two first are those which produce the greater part of the silver which is coined and exported from the State of Oaxaca, the District of Ixtlan, containing the largest number of mines in operation.

The metalliferous grounds of Ixtlan and Villa Alta are found on the Northern slopes of the great Cordillera, whose summits are formed of enormous masses of feldspathic porphyry, and their formation belongs to the Devonian period, but more frequently to the Silurian. The veins are presented in a very irregular form, both as regards their direction and their dip. The ores consist of sulphurets of silver, arsenical and antimonial sulphurets of silver, native silver, gold, argentiferous galena, accompanied by yellow copper, malachite, quartz and pyrites, which are at times, impregnated with oxide of iron.

The mining districts within the State are as follows:

6 in Ixtlan, Lachatas, Amatlan, Calpulalpam, Totomoxtli, Quistepec and Xiacuí.

5 in Villa Alta, Talca, Yatoni, Yace, Taba and Solaga.

1 in Juquila, Santiago Minas.

13 in Villa Alvarez: Tamazola, Nuxa, Tlazo, Altepec, Tepantepec, Teosacualco, Yocucundo, Camalcua, Santa Inés del Monte, San Pablo Cuatro Venados, San Miguel Peras, San Felipe Zapotitlan and San Juan Elotepec.

1 in Ocotlan: San Jerónimo Tabiche.

1 in Etla: Tlazoljaltepec.

The system employed for the reduction of these ores, is that of amalgamation by the patio process or in barrels, whilst there are two reduction works which concentrate and smelt. There are 27 reduction works established throughout the State, and the following list shows their names and the class of ores which they treat:

6 in Villa Juárez (Ixtlan).

El Rescate, gold and silver.

Cinco Señores, mixed ores.

Santa Ana, gold and silver.

Socorro, gold and silver.

Yavexia, gold and silver.

Santa Anita, gold.

12 in Villa Alvarez (Zimatlan).

Dolores, mixed ores.

San Patricio, silver and lead.

Rosario, gold.

Cármen, gold.

Animas, gold.

Purísima, gold.

Rescate, gold.

Reyes, gold.

San Ignacio, iron.

San Estevan, iron.

La Paz, iron.

Candiani, lead.

3 in Nochistlan.

Purísima, lead.

Soledad, gold.

Guadalupe, gold.

5 in Etla.

Rosario, gold.

San Antonio, gold.

San Miguel, gold.

Refugio, gold.

Contreras, gold.

1 in Villa Alta.

Progreso, silver.

Many salt beds are found in this State, and particularly on the coast, in the districts of Pochutla, Tehuantepec, Juquila, and Jamiltepec. Their annual products can be estimated at 150,000 arrobas.

STATE OF CHIAPAS.

The territory of this distant State of the Federation, has never been explored by any scientific commission, which could give us reliable information with respect to its mining capabilities. From private sources it is known that the valley of Cus-tepeques and the district of Soconusco contain valuable mineral deposits of gold and copper, and that the stream which passes through Chicomuselo carries gold, as well as that these placers are to be found in various parts of the Sierra.

In the valley of San Cristobal, there is an abundance of lead, iron and talc, but the mines from which these metals have been extracted are at present abandoned.

Load stone is found in Tzementon, situated in the district of San Bartolomé or Libertad.

Sulphur, sulphate of soda, asphalt and many other substances are found in different parts of the State.

Lastly, the extensive beds of salt which are found in the valley of Cus-tepeques as well as the coasts of Tonalá and Soconusco, are worked to a very large extent and export salt to other parts of the coast and abroad.

MIDLAND STATES.

STATE OF DURANGO.

The Sierra Madre, which acquires a remarkable width in this State and that of Sinaloa, contains innumerable and valuable veins of metal, and a very large number of mines are worked which produce considerable quantities of valuable ores.

The principal mining districts of this State are as follows:

Indé, producing galenas and other argentiferous ores, some in the form of sulphurets.

El Oro, with alluvial gold deposits and veins, some of these latter containing arsenical pyrites with a high grade of gold.

Guanaceví, metalliferous porphyries with veins of sulphureous silver.

Coneto, containing tin.

Parrilla, with colored ores containing chlorides and bromides of silver as well as argentiferous galenas.

San Dimas, clear ruby silver associated with sulphureous silver.

Birimoa, sulphureous and antimonial silver.

Topia, argentiferous galena.

Pueblo Nuevo, is a recently explored zone, containing copper, lead, iron, manganese, zinc, silver and gold.

Close to the City of Durango itself, is found the inexhaustible bed of iron ore known under the name of "Cerro del Mercado." The mineral resources of the State of Durango, as well as of the other rich States of Zacatecas, Hidalgo and others, that occupy the central part of the Republic can be further studied by consulting the following works: Annals of the Department of Fomento, Vol. V, Historical Mines of the Republic, by Charles B. Dahlgren and Mineral Riches by Don Santiago Ramírez.

STATE OF SAN LUIS POTOSÍ.

The most important mining districts in this State are the following:

Catorce, situated in the mountain of the same name, whose principal veins are very rich and extensively worked. They are called, La Purísima, San Agustín, San Jerónimo, San Ramon, Los Frailes and Maroma. The ores can be classified under three heads, native silver in pebbles and plates, chloride of silver or horn silver; sulphureous, fuliginous or powdered silver ore. The mineral district of Catorce extends as far as the Cerro de los Frailes, in the immediate neighborhood of Matuhuala, where the principal reduction works are to be found.

Guadalcázar. According to D. Santiago Ramírez, the veins of this district belong to three systems; that of Minas Viejas, to the East of the Cerro San Cristobal, containing silver ores; that of San Juan to the North West of the same hill, containing a mixture of argentiferous galena with gray silver, and other forms of that metal; and that of San Juan to the South of the same hill, which contains silver associated with galena and white lead, forming good fluxing ores. Besides these the mines contain other forms of silver adapted to the Patio process, and others associated with copper. Besides the above mentioned, there are several valuable beds of cinnabar found in Guadalcázar, one of which is in the important mine of La Trinidad, where the cinnabar is found of a dark color, associated with gray lead.

In the District of San Luis, we have the important mines of San Pedro and Bernalejo. In the first of these two the ore is found in bunches or pockets associated with iron, manganese, lead, calcium, barium, arsenic and gold. In the second mine a large number of veins of silver are worked.

In the district of Charcas, exist mines of fuliginous and sulphureous silver as well as horn silver, they also extract black ores which are called antimonial and sulphureous silver and some galena.

In the district of Ramos, sulphureous and native silver is produced, red and dark ruby silver, and gray copper impregnated with pure silver.

Peñon Blanco, is an important district on account of its abundant deposits of salt, which are extensively worked. Amongst them we have Laguna del Tapado in the district of Moctezuma, and the salt beds of Concordia and Santo Domingo which produce Glauber salt.

STATE OF ZACATECAS.

The mineral districts which exist in this rich part of Mexican Territory, are as follows:

Zacatecas, Veta Grande, and Pánuco, in the Zacatecas ranges: Fresnillo, at a distance of 15 leagues to the North of the City of Zacatecas; Sombrerete and Chalchihuites.

I. Zacatecas, situated in the mountain range of the same name, contains innumerable veins crossing it in all directions and containing ores of sulphureous silver, ruby silver, native silver, galena of all classes, brown, black and yellow blende, whilst argentiferous and sulphureous pyrites are found in great masses of handsome crystals.

II. Veta Grande, is situated in the same mountains, two leagues to the North of the City. The extensive and rich vein that has produced fabulous sums to the miners, is of great width and produces cristallized sulphureous silver, native silver in blocks, leaves and threads, dark ruby silver, silver sand, galena, carbonate of lead and different colored blendes besides many classes of ores too numerous to mention.

III. El Pánuco, is also situated in the same ranges but still farther North, and possesses a combination of mineral veins with a high grade of silver and gold. Amongst these, the most famous is the Veta de los Tajos, one of the first to be worked by the Spaniards.

IV. Fresnillo is situated 15 leagues to the North of Zacatecas. In this district is a hill called Cerro de Proaño containing more than a hundred veins which have been worked from the surface and have produced an abundance of native silver, horn or green silver, antimonial and arsenical silver, sulphureous silver, black silver, dark ruby silver, galena, black and purple blende, gray antimony, copper and iron pyrites and in some cases virgin gold.

V. Sombrerete, is situated on the road to Durango, 36 leagues North of the City of Zacatecas and on the boundaries of the State. The conical hill which is called Cerro del Pabellon, contains the veins of Pabellon, Veta Negra and San Lucas, with numerous mines, from which have been extracted gold, silver, lead, iron and zinc. The Sombrerete mining Company, posses-

ses a zone consisting of an irregular polygon with seven sides, and within which it works the three veins mentioned above. The mine of San Francisco, has a weekly output of 82 tons of ore of two classes, the first being exported to the United States with the following assays: 60 to 70 per cent of lead, a little gold and 90 ounces of silver per ton, whilst the second class is reduced on the spot by the lixiviation system, and has a mean assay of 39 ounces of silver per ton.

VI. Chalchihuites, is situated $3\frac{1}{2}$ leagues to the South of the former district. It contains a great many veins of lead ores which are very valuable as fluxes.

VII. Mazapil is situated in the Sierra of the same name, on the Northern border of the State. This range of mountains connects with others containing the mineral districts of Albaradon, Cedros, Bonanza, Concepcion del Oro and Rosario and is prolonged to the westward by the Pico de Teyra, which also produces a great variety of ores in which the gold largely predominates. The mineral district of Mazapil contains numerous veins and a large number of mines which have produced gold and silver, copper, in the form of malachite, blue and yellow copper. It also contains brown magnetic and specular iron; lead, quicksilver in its native form and as cinnabar, zinc, sulphur, blende and arsenic.

VIII. Pinos is situated 30 leagues to the East of the City of Zacatecas. Its veins are very remarkable on account of the high grade of its ores, which contain native gold and green silver mixed with gold.

IX. Noria de Angeles. This district is situated 12 leagues to the westward of the last named. Its ores consist of a mixture of galena and arsenical pyrites, which are treated by smelting and amalgamation, according to their grade. Previous to this treatment they are concentrated and roasted in a reverberatory furnace.

STATE OF AGUASCALIENTES.

This State of the Union contains the rich mineral districts of Asientos and Tepezalá. The former was celebrated in former times for the bonanza produced by its principal mines of Descubridora, Santa Francisca, Romana, Santo Cristo, Cinco Señores and No Pensada. Its mountains are of a calcareous formation with porphyry on the summits, and contain veins of silver in their different forms of sulphurets, dark ruby silver, chloride of silver, besides galena and copper, double sulphurets of copper and many other metals. The mineral district of Tepezalá in which copper smelting works are established, produces an excellent quality of magistral, besides a superior class of copper, tin and lead.

STATE OF GUANAJUATO.

Guanajuato, which is as rich in mineral productions as Zacatecas, has always been a great mining centre. This important locality contains five mining districts, which are: Guanajuato, Leon, Sierra Gorda, Allende and Santa Cruz. The first of these contains the richest mines, and they are situated on the hill between the Cerro del Naya and El Cubo as far as El Gigante, and from Marfil, Cubilete and La Luz to Villalpando and Santa Rosa, forming a district 40 kilometres in length by 36 in width. The mines of Guanajuato were discovered in 1548, and the vein of San Bernabé, near El Cubilete was the scene of the first works. Ten years afterwards, the Veta Madre vein was discovered, and on it were successively opened the mines of Valenciana, Tepeyac, Cata, Santa Ana, Santa Anita and others. The substances which constitute the matrixes of this great vein are common quartz, calcareous spar, and horn blende, whilst its argentiferous ores are in the form of sulphureous silver, native silver, prismatic and dark red or black silver, a light colored ruby silver, sometimes semi-prismatic, argentiferous galena, iron and copper pyrites, the argentiferous

ores sometimes containing native gold. Later explorations have led to the discovery of other minerals such as stream tin and bismuth.

The District of Sierra Gorda extends over an area of 1,158 square kilometres of country containing minerals of different classes. Some of these deposits are of poor quality but capable of producing large amounts, but in some places, blocks are found of pure cinnabar. In the District of Atarjea, numerous veins of argentiferous lead are being worked, and in that of Pozos, the products mostly consist of carbonate of copper.

STATE OF QUERÉTARO.

According to Don Mariano Bárcena, the geographical distribution of the minerals in the State of Querétaro, can be considered as concentrated in certain special points which are: Las Aguas, El Doctor, Toliman and San Antonio Bernal, which contain gray copper, native and sulphureous silver. The hills of San Nicolás and San Antonio contain lead ores, whilst the same hill of San Nicolás and a large zone to the westward of itself towards the Mesa de los Pozos, contains cinnabar, and the Hacienda de la Esperanza produces a large quantity of fine opals.

The mineral zone of Rio Blanco in the district of Toliman has a superficial area of 30,000 hectares, of which 6,132 properly belong to the mineral zone of Atarjea. The principal work is now being carried out in the mine of Nueva California which produces gold in a matrix composed of oxides of iron, calcareous spar, fluor spar, and occasionally garnets. Cinnabar is extracted from the mines of New Almaden, and its reduction is very economical from the abundance of fuel in that region.

STATE OF HIDALGO.

The principal mining districts in the State of Hidalgo are Pachuca, Real del Monte, Atotonilco el Chico and Zimapan,

the first three being situated in the mountains of Pachuca and the last in those of Zimapan.

The numerous argentiferous veins that are found in the metalliferous porphyry of the Pachuca mountains, in which the first three districts are situated, contain native silver, sulphureous silver, malleable silver, ruby silver, yellow copper and pyrites which at times are very rich in silver. In descending from the surface to the interior of a mine in Pachuca, three distinct formations are noted in the veins: the first is accompanied by manganese in state of "Psilomelan," "Pirolusite" and other varieties of these, the ores of this class being called "Que-mazones" or roasting ores; in the second, the minerals are stained by the oxide of iron and are called "colorados" or red ores, whilst in the third the quartz is mixed with sulphureous silver giving it a bluish color, for which reason it is called "Pinta Azul" or blue ore.

The principal and most famous mines of this interesting district, are El Rosario, Cuautimotzin, San Pedro, El Jacal, Candado, Porvenir, La Corteza, Santa Gertrudis, Trompillo, Concordia, Amistad, Potosí, Maravillas, San Buenaventura, Pabellon, Sacramento, San Cayetano, El Cristo, Guadalupe, Encino and many others in Pachuca; Vizcaina, Moran, Santa Inés, Valenciana, Rosario, Santa Brígida and others in Real del Monte; Arévalo, San Antonio, San Marcial, Compañía, Capula, Tetitlan, Santa Ana, San Isidro, and others in the district of Atotonilco el Chico. Of all these mines, the ones which are at present giving the largest extraction, are Santa Gertrudis, Maravillas and Trompillo.

The mineral products of Zimapan, a town situated 120 kilometres to the west of Pachuca, are: an abundance of argentiferous galenas, and gray copper, whilst oxides and carbonates of lead, are not scarce. All these lead ores are very useful as fluxes for smelting silver. Besides the districts above mentioned, the State of Hidalgo contains the following: District of Potosí, situated in the jurisdiction of Atotonilco el Chico, but whose

veins are not at present worked as they have been lost. District of Jacala, 40 kilometres to the North of Zimapan, which produces gold, silver, carbonate of lead, magnetic iron, oxides of manganese and carbonate of copper.

The systems of reduction employed in the mines of this State, are those of amalgamation by the Patio process and in barrels, as well as that of smelting, and for these purposes large and well appointed establishments have been set up.

STATE OF MÉXICO.

The State of México contains the following mining districts: El Oro, Temascaltepec, Sultepec and Zacualpam. The first of these districts produces native gold, native silver, sulphureous silver, gray silver, powdered silver ore, bromide and chloride of silver, oxides of iron and manganese.

The rich mineral district of Temascaltepec, produces a great variety of metals, such as native silver, silver mixed with gold, sulphureous silver, galena and argentiferous pyrites.

In Sultepec, the extraction includes, gold, silver, copper, iron and lead.

And lastly, the district of Zacualpam, which is no less rich than the others, produces: clear and dark ruby silver, sulphureous silver, native silver, black and gray blende, galena, copper pyrites, and gray antimony, but the principal value of its veins, consists in the ruby silver and sulphureous silver.

STATE OF PUEBLA.

The principal mining districts of this important State, which have hitherto been very much neglected, are as follows: district of Temextla, which is united by the Sierra de Tlatlauqui with that of Zomelahuacan, in Veracruz, and produces nearly pure gold, as well as galena, with a good proportion of silver and copper.

The hills of Xochiapulco and Xochitlan contain an abundance of zinc.

District of Tetela. This is the oldest and most important mineral district in the State, situated 92 kilometres to the N. N. E. of the Apizaco Junction. The Cerro del Convento, which is the richest, produces gold in narrow threads contained in the quartz, or in small grains scattered throughout the matrix. It also produces silver of two classes, known under the names of "polvo-rilla" and "jaboncillo." The district of La Preciosa, in the neighborhood of Chalchicomula, contains some rich veins of silver.

In the district of Matamoros and in the neighborhood of the villages of Culucan and Colotlan, veins of lead and silver are known to exist, whilst the districts of Acatlan and Chiautla, contain valuable veins of gold, silver, iron and marble.

Coal beds are known also to exist in the districts of Matamoros, Chiautla and Acatlan, in close proximity to veins of iron ore.

And lastly, the district of Tehuacan is known to contain extensive deposits of the precious metals and of fine marbles, and the same may be said of Atlixco, Matamoros and Tecali. This last town is famous as the first from which was extracted the beautiful onyx for which this State is so celebrated, and whose exportation is now assuming important proportions.

STATE OF TLAXCALA.

This State is essentially agricultural, but amongst its mountains are found a few mineral deposits, and the principal ones discovered up to this date, are the following:

In the village of San Antonio, in the district of Hidalgo are found veins of silver and gold, besides lime stone impregnated with the same metals.

In the village of Temetzontla, belonging to the Municipality of Tlaxcala, we have a vein of silver ore which assays a little gold.

In a gully near the village of San Marcos Huexoyucan, veins

of silver and iron have been discovered. In Tizatlan, belonging to the Municipality of Tlaxcala a mine of chalcedony exists.

In the country between the villages of Huexoyucan and Temetzontla, in the district of Hidalgo, coal beds have been discovered.

STATE OF MORELOS.

The only mineral zones worthy of the name in the State of Morelos, are those of Huautla and Oastepec. The district of Huautla is situated 12 leagues to the South of Cuautla Morelos, and has five mines, which are: Tlachichilpa, in the Cerro Frio, which produces a conglomerate charged with silver assaying 13 marks per carga. San Esteban is situated in the same hill, producing galena, which assays one a half marks per carga; San José, in the same place gives galena, with 10 marks per carga. Concepcion which is situated in the Cerro de las Animas, gives an equal production, and the same may be said of La Peregrina, situated as a point called Salitre. The system followed for reducing these ores, is that of amalgamation.

The hill of Oastepec, in the district of Yautepec, yields ores of argentiferous galena.

The Municipal district of Cuernavaca contains a range of hills called Barriga de Plata, in which were formerly worked a number of silver mines.

In Jiutepec, there is another hill which is almost entirely formed of carbonate of lime, a handsome marble with beautiful veins formed by the different oxides contained, and accompanied by selenite of a very good class.

Cinnabar is found in different parts of the State and particularly in Santa Rosa, in the Municipal district of Tlaquilte-nango.

We have above shown the principal mineral products of Mexican territory, as well as the most important mineral districts, but without entering into any great detail, which would