MINERAL INDUSTRIES OF PORTO RICO

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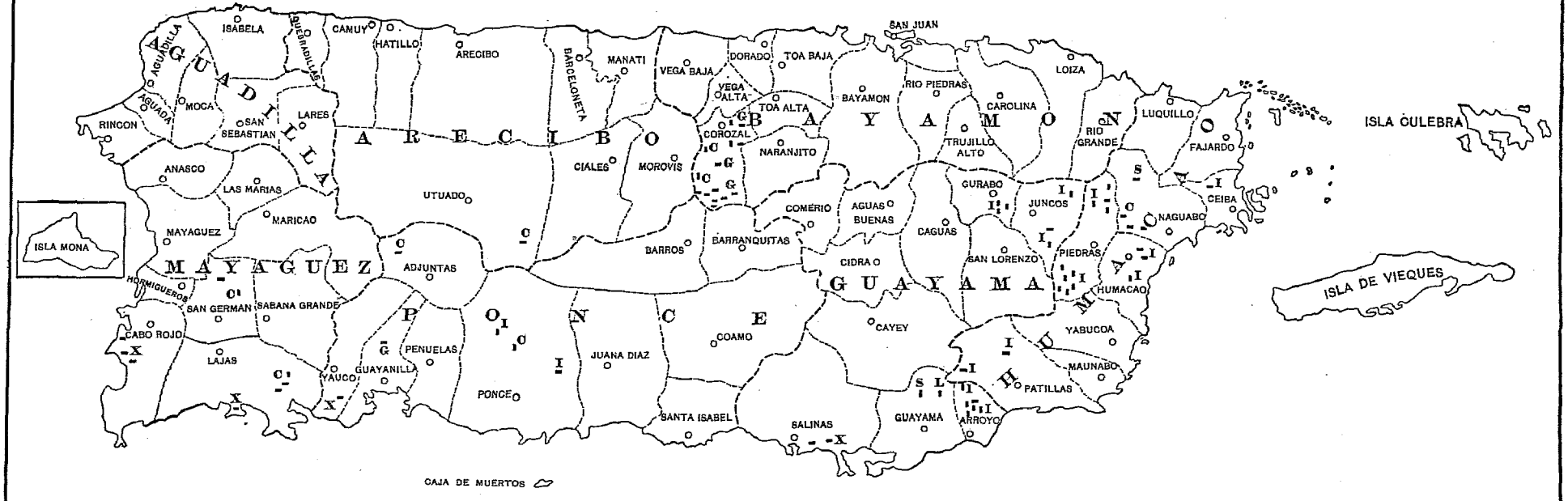


MAP OF

PORTO RICO

Showing Location of

MINING CLAIMS

- I Iron
- L Lead
- C Copper
- G Gold
- S Silver
- X Salt Deposits

MINERAL INDUSTRIES OF PORTO RICO.

By WILLIAM F. WILLOUGHBY.

The investigation of the mineral industries of Porto Rico for the year ending December 31, 1902, report of which is given in the pages that follow, representing, as it did, the first attempt to present a comprehensive exhibit of the character and importance of the mineral resources of the island and of their exploitation, had to contend with the difficulties usually attendant upon initial statistical or census work in any field. These difficulties consisted not so much in securing data concerning mineral deposits and their working, after their existence was known, as in securing information concerning such existence and working itself. In the present case this difficulty was especially acute owing to the lack of official data and the fact that in no case were mining operations being conducted as a regular industrial enterprise. Such work as was done during the year was almost wholly of a prospecting and experimental character. Even brickmaking and stone quarrying were carried on in an intermittent manner, bricks being made as demand arose for them and quarries being worked here and there by contractors in need of material for roadmaking.

In view of these conditions it was deemed that the most important work that could be done by the investigation would consist of presenting (1) such historical data as could be obtained regarding the search for, and discovery of, minerals in the past, and efforts that had been made for their utilization; (2) a statement of the laws in force regarding the location and exploitation of mining claims; (3) a list of all mineral deposits of which information could be secured by making the most thorough investigation possible; and (4) an account, with such statistical data as could be obtained, of work actually done during the year in the utilization or manipulation of such mineral resources.

In these efforts it is believed that, thanks to the cooperation of the different insular and local officials, a large measure of success has been attained. The thoroughness of the canvass may be seen from the following statement of the means employed in securing information. In addition to the personal researches of the author and his assistants, information was sought and secured from each of the sixty collectors and deputy collectors of taxes attached to the Treasury Department of the island, whose duties are such as to make them personally acquainted with every important taxpayer or industrial enterprise in their respective districts, from the twenty-odd internal revenue agents whose duties take them to every part of the island, no matter how difficult of access, and finally from all the contractors and superintendents engaged in the construction or maintenance of the highways. The commissioner of the district of Porto Rico and the chief of the Bureau of Mines under his jurisdiction likewise rendered every possible assistance in the way of furnishing data taken from official records and in directing all of their employees to furnish any information in their power.

Mining, as generally understood in the United States, has not up to the present time been a stable industry in Porto Rico. Certain minerals were known to exist by Ponce de Leon and his followers in the early part of the sixteenth century, but no systematic or scientific methods were then, or have been since, employed in their extraction. The absence of any relics pertaining to the period antedating the discovery of the island by the Spaniards would tend to show that metals were not used in the manufacture of warlike implements or domestic utensils, neither has there been unearthed any metal adornments, such as anklets, arm rings, or similar decorations with which primitive tribes conversant with the use of metals were wont to adorn their women folk. The complete absence also of shafts, tunnels, and other evidences of ore mining, such as are being constantly uncovered in other Spanish-American countries, would further tend to confirm the opinion that neither the Borinqueños nor their Spanish conquerors practiced mining except in a desultory manner, and the lack of historical mention of such industry likewise strengthens this belief. Fray Iñigo Abad, in his "History of Porto Rico" (1788), makes reference to early remittances of gold to the Spanish peninsula, but all the gold extracted was undoubtedly obtained from river washings by enforced native labor. In his description of the effects of the great hurricane of 1530 the same historian says: "Se volvian los ojos á las minas, las veian todas sumer-

gidas por las crecientes de los rios" (They turned their eyes to the mines, but found them all submerged by the overflow of the rivers).

Official or other reliable data relative to the geological formation of the island is also practically nonexistent. Some attempt to compile a report on the subject was made by Angel Vasconi, a Spanish engineer, and the result of his labors was laid before the directors of the Exposition of Mineralogy held at Madrid in 1883. The monograph comprising the report is not extant in Porto Rico, but a portion of the rough draft was found among the archives of the insular Bureau of Mines by its present chief and was largely drawn upon by the Governor of Porto Rico in his second annual report to the President of the United States. The information therein contained is considered worthy of reproduction as presenting in succinct and precise form what little is known of the mineral bearing formations which go to make up the soil and subsoil of this new possession of the United States.

[Extract from the second annual report of the Governor of Porto Rico to the President of the United States.]

Gold placers were worked for some years by the Spaniards in the first century of the conquest, and, according to official statistics, 2,700 pounds of gold were sent to Spain from the year 1509 to the year 1536. It is believed that that figure only represents the part belonging to the Crown of Spain—that is to say, the fifth of the total production during that period of time.

The Sierra de Luquillo, the more abrupt and the highest of all the mountains in Porto Rico, belongs to the main cordillera, or chain, which cuts the island from east to west, with a prolongation to the Windward Islands, by the east, and to the little island of Desecheo, situated opposite to Mayaguez and Añasco, by the west. That mountain, or sierra, is in the northeastern part of the island, and owing to its situation and the elevation of its hills—the highest being El Yunque, 1,200 meters [3,937 feet] above sea level—is the first vessels can distinguish in coming to Porto Rico. From El Yunque and the hills named Cuchilla Firme, Meseta, Peña Parada, and others, various rivers flow in which gold has been found. The Mameyes, one of the richer in gold, has as tributaries the rivulets known as Filipina, Cajones, Guaraguao, La Mina, La Máquina, Tabonuco, and Anon. In this last named, the Anon, some thirty-eight years ago, a rich concern did some work in the washing of sands or auriferous alluvia, obtaining from one to two pounds of fine gold per day. The rocks more abundantly found in the watershed of Mameyes River are eurite and porphyry, crossed with veins of quartz and iron pyrites. The alluvial lands occupy a good extension of the middle and lower parts of these watersheds, and are composed of clay, sand, and bowlders, forming deposits of analogous nature. Their depth is variable. In the valley of the Anon there are some cuts, from six to eight meters (20 to 26 feet) deep, made in such alluvial deposits with the view of exploiting the auriferous strata.

It is known that the watershed of the rivers Corozal, Negros, Congos, Cibuco, Mavilla, and Manatí contain auriferous sands. The idea which occurs to one examining the vicinity of Corozal is that that valley was emptied, through a process of erosion, by the diluvial waters, which produced in the calcareous soil cuts more than 130 meters [427 feet] deep, through which ran a stream. It is believed that the waters of that stream deposited the quaternary alluvia. The calcareous soil, said to be of the Tertiary formation, occupies the right shore of the river and extends itself by the north toward the sea. On the left shore, and in the bed of the river, the limestone has disappeared, giving place to potent strata of sandstone, on which the auriferous quaternary alluvia lay. The alluvial deposits are more potent the lower they are, and gold is found very near the surface in the higher and hilly parts, while, on the contrary, in the great deposits of the lower parts of the valley the auriferous strata are covered by sterile masses. Near the source of the Congos River, in the bed of it, and 25 centimeters (9.8 inches) deep, some pieces of quartz have been found containing from 8 to 10 grams [123 to 154 grains] of pure gold. In the jurisdiction of Corozal some washing machinery was established, and the result was from $2.17 to $4.30 for each ton of sand.

There are also, according to official information, some gold placers in Mayaguez, San German, Yauco, and Coamo. The gold is found in grains or nuggets of $2 or $3 value, and, rarely, nuggets of even higher value. In the Fajardo River a piece was found which weighed 4 ounces, and in the Congos another piece of 1 pound was also found; but the biggest piece of pure native gold was discovered in the lands belonging to Mr. Bou, in the jurisdiction of Corozal. That piece was sold to Mr. Bou by the finder for $200 in money and some other valuable things. In the bed of the Filipina rivulet there were obtained from 60 kilograms [132 pounds] of sand six-tenths of a gram [9 grains] of pure gold, which makes 10 grams [154 grains] for 1 ton of sand. The enterprises mentioned were abandoned, and the only work on the mines was done by the "lavadores," washmen. They use an instrument called "gaveta," made of wood, shaped like a plate, of 40 centimeters [16 inches] in diameter and 12 centimeters [5 inches] deep. In the watersheds of Mameyes River and in all the rivers crossing the jurisdiction of Corozal numbers of peasants can be seen engaged in the work of washing auriferous sand, from which they obtain gold in amount sufficient to pay for their support.

Since the American occupation, work on the mines has had renewed life, and the number of applications for mining concessions filed in the Bureau of Agriculture and Mines has increased. Up to July concessions have been granted for 107 hectares (264 acres) of land.

The minerals of copper obtained are: Ferriferous motley copper, native copper, green and blue carbonates, yellow copper sulphide, often accompanied with iron pyrites and iron oxides. Spanish explorers of the island paid little or no attention to copper. It is generally found along the main chain of mountains dividing the island from east to west, from the neighboring island of Vieques, and then following through Rio Blanco, Gurabo, Corozal, Ciales, Jayuya, Maricao, and some other places which belong to the southern chain of mountains, such as Las Piedras, Humacao, Ponce, Piñalejo, and also in the vicinity of the road from Caguas to San Juan, the richest place being the barrio of Rio Blanco, in the municipality of Naguabo. The first works for the exploitation of copper began in 1869. In the mine named "La Abundancia" some small excavations were made, and the superficial carbonate was gathered, and many tons of rich mineral were thus obtained. Like results were reached in the mines named Santa Amalia, La Castellana, and Santa Teresa, all located in the barrio of Rio Blanco. In the last-named mine copper indications were noted from the surface to a depth of 25 meters [82 feet], first as green carbonate with 23 per cent of copper, then as ferriferous motley copper, and, in some parts, yellow sulphide, very pure. In 1879, 10 tons of copper sulphide were obtained from the mine Santa Teresa, and 60 tons of carbonate of copper from the Santa Amalia. Owing to the difficulties and high prices of transportation, work ceased.

The existence of silver in the island has been officially recognized. On July 19, 1538, the "oficiales reales" wrote to the King of Spain that "veins of lead containing some silver have been found," and on March 29 of the following year they wrote, "With respect to the silver mines here discovered we arranged that that mineral be fused here, but there is no person who knows how to do it. In some places veins of that metal have been found, but nothing has been done, waiting the arrival of some one who knows how to fuse

and work it." In the History of Porto Rico, by Fray Iñigo Abad, with notes by Don José Julian Acosta, the statement is made that in the Serrania de Añasco there was a mine containing silver; and, in a report prepared in 1879 by the chief engineer of the bureau of mines, reference is made to certain samples of silver found in the barrio Llamos, of the municipality of Isabela. In other official documents the existence of silver in the northwestern part of the island is affirmed. Concessions have been made of silver mines in Naguabo, Corozal, Rio Grande, Fajardo, Lajas, and Las Piedras.

In the subsoil of the eastern part of the island there is feldspathic rock. This section is confined on the north by the Sierra de Luquillo, and on the south by the Pandura, parallel ranges of hills, and distant one from the other from 25 to 30 kilometers (16 to 19 miles). It is stated that the surface lodes occupy a large area, the depth not having been determined as yet. Iron is found, according to tests made, at the rate of 61 per cent of the mineral. Iron of excellent quality has been found in the barrios Maneyes and Jayuya, municipality of Utuado, and in Luquillo, Piedras, Naguabo, Humacao, Gurabo, Patillas, San Lorenzo, and Arroyo. The concessions of iron mines are numerous. Some efforts are being made now with the view of organizing enterprises for the exploitation of iron in the eastern part of the island.

There are in the island, according to official information, some deposits of lead minerals. Good samples of galena have been found in Arroyo, Mayaguez, and Naranjito. There are two concessions granted in the municipality of Guayama, one being for the exploitation of lead and the other for argentiferous galena. Minerals containing some amount of peroxide of manganese have been gathered in the vicinity of Corozal. Native bismuth has been discovered in Ponce. Samples of platinum, tin, and mercury have been obtained in the jurisdiction of Corozal.

All other official reports touch but lightly on the mineral resources of the island and do not convey any information not embodied in the foregoing extract. Mr. Robert T. Hill, of the United States Geological Survey, in his accurate and interesting work entitled "Cuba and Porto Rico," devotes but ten lines to the subject, saying:

A little placer gold is found in the rivers of the Sierra Luquillo and Corozal, and mercury in the Rio Grande. Gold was formerly mined by the early Spanish settlers and is still taken out in small quantities by the natives. Molybdena, magnetic pyrite, manganite, limonite, chrysocolla, epidote, and garnet are the minor minerals found. Specular iron is reported in several places, notably in the river Cuyul. Magnetic iron is also reported from Gurabo and Ciales. Crystals of quartz are found in the Rio Prieto, agate of good quality at Caja de Muertos, and malachite at Rio Blanco.

MINING LAWS.

Notwithstanding the absence of anything approaching an organized mining industry in Porto Rico there is, nevertheless, a complete system of laws and regulations governing the right to exploit both precious and base metals in the island.

This is substantially contained in the law of July 6, 1859, and the ministerial order of December 29, 1868, enacted originally for application in the Spanish peninsula only, but subsequently extended to Porto Rico by the law of May 3, 1895. Many of the provisions of these statutes have by reason of the change of sovereignty become inapplicable, and it is understood that a new mining law is being drafted and will be presented at the next session of the insular legislature. In so far as possible, however, the principles and procedure of the existing laws are being observed, and deficiencies arising from changed political conditions treated by analogy.

Minerals subject to mining claims are divided by the law into three classes, as follows:

Class I: Minerals of an earthy nature, minerals of a siliceous nature, slates, minerals of a sandy nature, granites, basalts, limestones, gypsums, sands, marls, clayey earths, construction materials in quarry formation.

Class II: Placers, metallic sands or alluvia, bogs, emery, ochers and almagras, scoria and mineral tailings, peats, pyritic earths, aluminous earths, magnesium earths, salt deposits, lime phosphates, barytes, fluorspars, steatites, ravolins, clays.

Class III: Metallic veins, anthracites, pit coals, lignites, asphalts, bitumens, petroleum and mineral oils, graphites, saline substances, including alkaline and terraceous salts, either solid or in solution, copperas, sulphur, precious stones, iron ores.

In order to obtain legal title to a mining claim the claimant must submit a petition to the Commissioner of the Interior of Porto Rico setting forth the area of the desired claim, the class of mineral to be worked, and the name of the owner of the property wherein the claim is situated. He must also furnish a survey of the claim and, within ten days from date of filing his petition, must deposit the sum of $36 if the claim does not exceed in area 12 pertenencias (30 acres), and $1.20 for each additional pertenencia. No claim can be filed for less than 4 pertenencias, but there is no limit to the number of pertenencias that may be included in one claim. Each pertenencia must, however, be contiguous along the whole of one of its sides to some other pertenencia of the same claim, and must consist of a regular square, each side measuring 100 meters (328 feet). The aforesaid deposit is to cover the expense of an official survey made later by the Government. The first conditions being complied with, the petition is advertised for sixty days to enable protests to be filed, which protests are submitted to the claimant for reply within twenty days. The complete brief is then passed upon by the Commissioner of the Interior of Porto Rico, and his decision, if favorable to the claimant, is followed by the appointment of a surveyor to lay out the claim and the payment of a further fee by the claimant, amounting to 60 cents per pertenencia (2½ acres), to cover expenses of title. A title signed by the Governor is then issued, and is valid forever, subject to an annual rental (canon de minas) of $2.40 per pertenencia for precious metals, or 96 cents per pertenencia for base metals. This title does not carry any obligation to work the mine, and lapses only on failure to pay the annual rental.

Pending legislation relative to the disposition of public lands (terrenos baldios), no mining claims are being allowed on public property.

PRECIOUS METALS.

There are at present twenty mining claims registered on the books of the Bureau of Mines, none of which, however, is in operation.

Registered mining claims of precious metals.

NAME OF OWNER.	Name of mine.	LOCATION OF MINE.			AREA OF MINE—		Class of mineral said to exist.
		Department.	Municipal district.	Ward.	In hectares.	In acres.	
Henry D. Sayre	San Luis	Bayamon	Corozal	Negros	18	44	Gold.
Do	O'Reylly	do	do	Padilla	25	62	Gold and other.
Do	Sayre	do	do	Palos Blancos	14	35	Do.
Josef Zervas	Augusta	Ponce	Guayanilla	Pasto	24	59	Do.
Wm. B. Crawford	La Palma	Bayamon	Toa Alta	Palmarejo	12	30	Do.
Henry D. Sayre	Rachel	do	Corozal	Cuchillas	32	79	Do.
Do	Lena	do	do	Negros	12	30	Do.
Do	Henry	do	do	Cuchillas	35	86	Do.
Do	The World	do	do	Palos Blancos	148	366	Do.
Do	Huyler	do	do	Cuchillas	12	30	Do.
Do	Dunham	do	do	do	12	30	Do.
Do	Mate	do	do	Negros	12	30	Do.
M. Lancaster	Palmarejo	do	do	Palmarejo	24	59	Do.
D. McLean	Florine	do	do	Palos Blancos	25	62	Do.
Do	Edwin	do	do	Dos Bocas	12	30	Do.
Henry D. Sayre	Ethel	do	do	do	17	42	Do.
C. Bernstein	Catinesterlila	Humacao	Luquillo	Maneyes	12	30	Auriferous sand.
Argueso & Miner	Ernestita	do	Naguabo	Rio Blanco	100	247	Silver and nickel.
D. McLean	Vanderbilt	Bayamon	Corozal	Dos Bocas	12	30	Silver and other.
Hogan & Pierce	Reina del Cobre	do	do	do	12	30	Do.

All of these claims have been filed since the American occupation of the island, and some little exploration work has been done in the case of a few of the claims situated in the Corozal district. The owners of each of the above-enumerated claims have been interrogated by letter as to whether their respective claims were in operation, but except from the owners of two of these claims (Augusta and La Palma) no response has been elicited. The owners of the other mines are not to be found at present in the island. It may, therefore, truthfully be said that ore mining of precious metals is entirely prospective and confined to the filing and registration of the above-mentioned claims, none of which is being exploited.

PLACER GOLD MINING.

Such gold mining as is actually engaged in at present in Porto Rico is entirely of the placer type, unimportant in scope and confined to the Corozal district of the island. There are some twenty or more miners of the peon class engaged steadily in the work of extracting gold from the sands of the river by means of an oscillating movement of the hands applied to a wooden disk in which the sands are washed. From the best information obtainable, the value of the gold thus secured daily will aggregate, approximately, $25. It is understood that Mr. Henry D. Sayre, who is the *concessionaire* of eleven mining claims in the Corozal district, intends shortly to operate on an extensive scale. Mr. Sayre is an experienced miner, who has invested a considerable sum of money in exploration, surveys, and assays in Porto Rico, and is said to be very favorably impressed with the mineral wealth of the Corozal district. He has recently applied to the executive council of Porto Rico for a franchise authorizing him to divert the waters of the Mabille river from their natural course with a view to obtaining the deposits of gold in the river bed. Whether any attempt at ore mining will be made by Mr. Sayre is not at present known, but it is understood that he claims to have discovered the original veins from which the deposits in the river bed are derived. Although there is evidence of placer mining having been practiced in other parts of the island as well as in the Corozal district, particularly in the vicinity of San German, no mining for gold is at present carried on outside of the Corozal region. This failure to operate elsewhere in the island is doubtless due to the belief that the gold deposits in other sections have become so nearly exhausted as to preclude their extraction in quantities profitable even for the peon class.

BASE METALS.

The foregoing description of the situation relative to precious metals applies almost in its entirety to the baser metals. The following mining claims have been filed and are registered in the office of the Commissioner of the Interior of Porto Rico, but no single one of the mines appearing in the list is actually being operated.

Registered mining claims of base metals.

NAME OF OWNER.	Name of mine.	LOCATION OF MINE.			AREA OF MINE—		Class of mineral said to *exist*.
		Department.	Municipal district.	Ward.	In hectares.	In acres.	
Arturo H. Noble	Corcega	Ponce	Adjuntas	Guilarte	12	30	Copper.
John W. Conner	Freddie	Mayaguez	San German	Hoconuco Bajo	18	44	Do.
Pedro Santisteban	Soledad	Bayamon	Corozal	Padilla	6	15	Do.
Do	Elena and Eugenia	Mayaguez	Lajas	Lajas Arriba	15	37	Copper and other.
Do	Capron	do	do	do	15	37	Do.
Angel Mattey	Mercedes	Arecibo	Utuado	Jayuya	12	30	Copper and iron.
Henry D. Sayre	Anaconda No. 2	Mayaguez	San German	Cain Alto	40	99	Copper and other.
Miguel Porrata	Maria Josefina	Ponce	Ponce	Tibes	25	62	Do.
Alejandro Fernandez	Perseverancia	Humacao	Naguabo	Rio Blanco	12	30	Copper carbonate.
Manuel Ugalde	Esperanza	do	do	do	12	30	Do.
Argueso & Miner	Santa Amalia	do	do	do	100	247	Copper sulphate.
Pedro Santisteban	Santa Agueda	Mayaguez	Lajas	Lajas Arriba	15	37	Copper sulphate and carbonate.
Miguel Planellas	Estrella	Guayama	Guayama	Carmen	12	30	Lead.
Arturo Aponte	Rosita	do	do	do	12	30	Galena.
Pedro Santisteban	Esperanza	do	Juncos	La Ceiba	96	237	Iron.
Do	Eloisa	Humacao	Piedras	Colores	25	62	Do.
Do	Carranzana	Guayama	Juncos	do	20	49	Do.
Do	Palonia	Humacao	Piedras	Boqueron	40	99	Do.
Do	San Miguel	do	do	Colores	21	52	Do.
Do	San Anton	do	Humacao	Collores	12	30	Do.
Do	Begoña	do	Piedras	Colores	21	52	Do.
Do	Luisa	do	do	do	13	32	Do.
Do	Buen Suceso	Guayama	Gurabo	Mamey	71	175	Do.
Do	Providencia	Humacao	Patillas	Mariana	50	124	Do.
Jose Santisteban	San Pedro	do	Piedras	Boqueron	39	96	Do.
Do	San Ramon	do	do	do	47	116	Do.
Do	San Jose	do	do	do	28	69	Do.
Do	Asuncion	Guayama	Gurabo	Jagual	30	74	Do.
Do	Valentina	Humacao	Piedras	Colores	15	37	Do.
Do	Santo Tomas	do	do	do	12	30	Do.
Tomas R. Nido	Fortuna	Guayama	Arroyo	Anconcs	24	59	Do.
Carlos McCormick	Idalia	do	do	Laurel	77	190	Do.
Guillermo McCormick	El Bronce	do	do	do	31	77	Do.
Cayetano Rangel	La Victoria	Ponce	Ponce	Portugues	6	15	Do.
Pedro Santisteban	Sabina	Humacao	Humacao	Collores	36	89	Iron and other.
M. Porrata Doria	Celina	do	Fajardo	Chupacallos	24	59	Do.
Argueso & Miner	Maria	do	Humacao	Mariana	8	20	Do.
J. Cobian Valdes	Casualidad	Guayama	Arroyo	Anconcs	18	44	Oxide of iron.
Carlos McCormick	Seguridad	do	do	Laurel	54	133	Do.
Tomas R. Nido	Merceditas	do	do	do	93	230	Do.
Carlos McCormick	Palmira	do	do	do	62	153	Do.
Do	Margarita	do	do	do	53	131	Do.
Raimundo Uriarte	Aurora	Ponce	Ponce	Tibes	24	59	Do.
Pedro Gandia	Natividad	Humacao	Patillas	Real	54	133	Do.
Pedro Santisteban	Caridad	Guayama	Gurabo	Mamey	21	52	Do.
Do	La Fe	do	Juncos	Ceiba Norte	14	35	Sesquioxide of iron.
Ramon Latimer	Pilar	Bayamon	Corozal	Palmarejo	12	30	Pirolusita.

A letter of inquiry was sent to each of the owners of the above claims. The replies received may be classified as follows:

Not operated.—Pilar, Natividad, Aurora, Fortuna, Merceditas, Soledad, Eugenia, Capron, Santa Agueda, Eloisa, Esperanza, Carranzana, San Miguel, San Anton, Begoña, Luisa, Buen Suceso, Providencia, Sabina, Caridad, La Fe, San Ramon, San Jose, Asuncion, Valentina, San Pedro, Palonia, Santo Tomas, Mercedes.

Operations suspended.—Estrella, Rosita.

Operations confined to exploration and assay.—Maria Josefina, Celina.

Not reported.—Corcega, Freddie, Anaconda No. 2, Perseverancia, Santa Amalia, Idalia, El Bronce, La Victoria, Maria, Casualidad, Seguridad, Palmira, Margarita.

It is understood that some of the iron ore deposits are of an exceptionally rich character, fully equal in percentage of mineral to the famous Daiquiri mines near Santiago de Cuba. These deposits are situated inland some five or six miles from the eastern seacoast town of Naguabo, and can not be operated with profit until means of transportation is furnished to tide water.

SALT.

The production of salt in Porto Rico is confined exclusively to the southern coast. The process of solar evaporation is the only one employed, and that in its most primitive form. The consumption of this article, estimated from the best data obtainable, is about 300,000 quintals (15,000 tons) per year. All salt required for home consumption, as well as a large amount in excess for export purposes, could readily be produced in the island, but owing to insufficient capital (as alleged by persons engaged in the industry), want of skill in operating, or inclemency of the elements, and notwithstanding the fact that a protective duty of 12 cents per hundredweight has been imposed on foreign salt introduced into Porto Rico, thousands of tons of this commodity are annually imported from Curaçao. The Curaçao salt meets with ready sale here at prices ranging from 20 to 50 cents per quintal, whereas it is claimed that with proper management salt can be pro-

duced in Porto Rico at a maximum cost of 10 cents per quintal.

The production of salt in 1902 was almost nil. A canvass gave the following results:

Production of salt: 1902.

NAME OF OPERATOR.	Address of operator.	LOCATION OF WORKS.		Salt produced.	Package.	Value of package.	Net value of salt.	Process employed.
		Department.	Municipal district.					
Juan Padilla	Cabo Rojo	Ponce	Yauco	[1] 5,000	Sack	$0.03	$1,250	Solar.
Aneeto Caballero	Salinas	Guayama	Salinas	[1] 2,000	do		800	Do.
Juan Miguel Toro	Cabo Rojo	Mayaguez	Cabo Rojo	[2] 650	do		540	Do.
U. Lopez & Co	San German	do	Lajas		do	.03		Do.

[1] Hundredweight. [2] Bushels.

In view of the abnormally small production of salt in Porto Rico in 1902, shown in the above statement, it is of interest to reproduce here the reasons advanced therefor by some of the operators:

The reason of the production of the extremely small quantity of 650 bushels is the heavy rains which fell during the year 1902. In other years six, eight, or ten times the amount was produced.

The insignificant duties paid by foreign salts give rise to the anomalous condition in Porto Rico of importations from Curaçao and other places of a larger amount of salt than is manufactured in the island.

During the year 1902 no salt was produced from the deposit (Fortuna), the hurricane of 1899 having completely destroyed its utility to its former owners, and the whole of said year (1902) being employed by its present lessees in getting it into shape again.

Said deposits (Carmen and Monserrate) have in former years produced 25,000 to 30,000 quintals. The small production in 1902 was owing to the early rains along this coast.

The salt industry of Porto Rico does not produce the fifth of what it should, owing to the lack of capital on the part of the operators. With an initial expenditure of $5,000 the deposit I own should produce 100,000 quintals of salt.

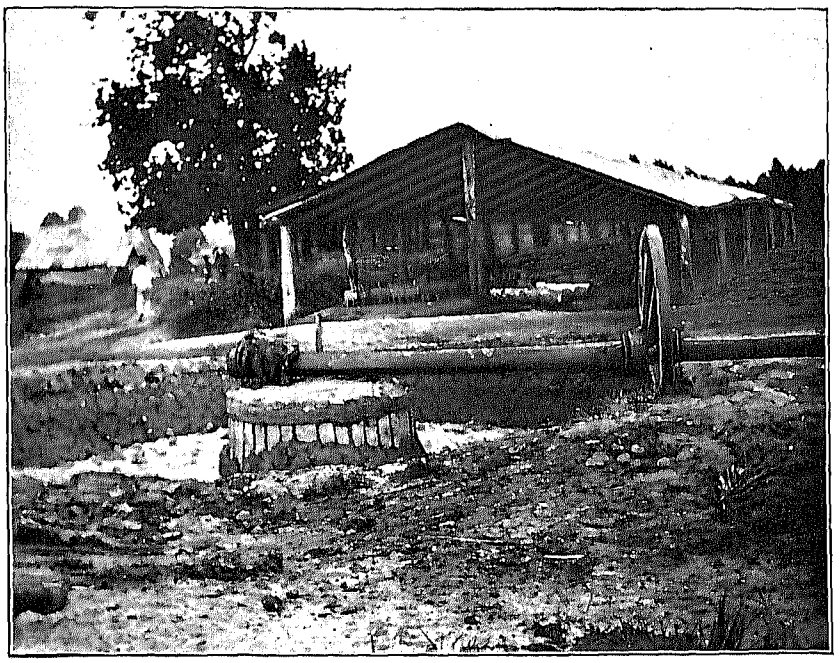
CLAY PRODUCTS.

No attempt has heretofore been made in Porto Rico to canvass this industry, consequently there were no initial data available to aid in the present study. It was known, in a general way, that bricks were made in the island, also that no modern machinery was utilized in their manufacture.

That the industry was not extensive or important was quite evident from the absence of brick edifices and the almost universal use of lumber in the construction of dwelling houses, except in the cities of San Juan, Ponce, and Mayaguez. This first inquiry, therefore, could not be other than crude and incomplete, by reason of the following facts: (1) No previous statistics existed showing establishments engaged in the industry; (2) brickmaking was not engaged in continuously by any one establishment, ovens being baked, from time to time, as the necessity demanded; (3) lack of precise information on the part of the operators themselves as to number of bricks made, their actual cost, average selling price, etc. For the foregoing reasons it is apparent that many persons who engage in the manufacture of brick as occasion therefor arises could not be reached at all. In the brief period at the disposal of the writer it was not possible to ascertain the location of more than 35 operators. Of these, 30 were successfully interrogated, with the results shown in the following table:

Clay products: 1902.

NAME OF OWNER.	LOCATION OF OFFICE AND FACTORY.		COMMON BRICK.			KILNS.	
	Department.	Municipal district.	Number.	Value.	Process used in making.	Kind used.	Number used.
Luis A. Bonnet	Vieques	Vieques	150,000	$1,500	Hand labor	Brick oven	1
Gavino Garces	Mayaguez	San German	60,000	360	do	do	2
Mariano Gonzalez	Bayamon	Carolina	120,000	250	do	do	1
Francisco Parra	Ponce	Santa Isabel	150,000	750	do	do	1
Federico Guzman	Mayaguez	San German	50,000	300	do	do	1
Santos Franceschi	Ponce	Coamo	20,700	144	do	do	1
Jesus Diaz	do	Yauco	100,000	500	do	do	2
Hacienda Florida	do	do	150,000	750	do	do	3
Isidro Sanjurjo	Mayaguez	Mayaguez	240,000	1,680	do	do	2
Mariano Renovales	Ponce	Juana Diaz	100,000	720	do	do	2
Vilella Hermanos	Aguadilla	Lares	50,000	400	do	do	1
José Irizarri	Ponce	Ponce	200,000	1,200	do	do	1
N. Arabia	do	do	800,000	5,200	do	do	2
Teresa Bardeguez	Humacao	Yabucoa	36,000	324	do	do	1
Sucn. C. Velasquez	Ponce	Juana Diaz	120,000	720	do	do	1
Severiano Ramirez	Mayaguez	Cabo Rojo	50,000	350	do	do	2
Gumersindo Lluch	do	do	17,000	136	do	do	1
Manuel G. Muñoz	Guayama	Cayey	80,000	640	do	do	1
M. Munitiz	do	do	80,000	480	do	do	1
Soc. Agricola "Tuna"	do	Guayama	250,000	2,000	do	do	2
Alfredo Cristy	Mayaguez	Mayaguez	180,000	1,260	do	do	4
Balbino Rodriguez	Aguadilla	Aguada	20,000	140	do	do	1
Fco. Antongiorgi	Ponce	Yauco	150,000	750	do	do	3
Mariana Sierra	Aguadilla	Aguadilla	66,350	520	do	do	1
Viuda de Battle	Mayaguez	Mayaguez	46,700	340	do	do	1
F. A. Vendrell	Ponce	Santa Isabel	50,000	300	do	do	1
Federico Gatell	Mayaguez	Mayaguez	100,000	700	do	do	2
J. Caloca	Bayamon	Rio Piedras	150,000	1,250	do	do	1
Juan Perez	do	do	135,000	1,080	do	do	1
Ca. Azucarera del Este	Humacao	Yabucoa	115,505	1,155	do	do	1
Total			3,837,255	25,899			45



PORTO RICO—OX-POWER WHEEL FOR MIXING CLAY.

PORTO RICO—MOLDING BRICKS BY HAND.

The foregoing table shows that in 45 kilns 3,837,255 common bricks, valued at $25,899, were produced in 1902, or an average price of $6.75 per thousand. It is not believed, however, that this actually represents the total number of bricks manufactured in one year in Porto Rico; probably three times the above number would more nearly approach a correct estimate. The process employed is absolutely and literally the hand process, and consists in mixing the clay with water in a wooden trough until the requisite consistency is obtained. The mass is then molded into bricks by hand, the operator employing a wooden mold for that purpose. The crude bricks are afterwards placed in a brick oven and baked, when they are ready for market. Bricks made in this manner are not nearly so durable as those manufactured in the United States by means of approved modern machinery. Clay roofing tiles were extensively manufactured in Porto Rico at one time, but since the introduction of cheap iron roofing have entirely disappeared from use.

LIMESTONE.

With the exception of the fringe of flat lands lying between the coast line and the mountainous formations in the interior, the island of Porto Rico is practically one vast limestone deposit. Owing to its abundance and accessibility, and to the fact that its conversion into the proper form for use in building and kindred purposes requires no large outlay of capital, the industries having to do with lime rock, while quite numerous, are too scattered and unimportant to admit of the compilation of statistics on any elaborate scale. It is by reason of the foregoing considerations, also, that limestone and its products command no stable price in Porto Rico. Owing to the propinquity of certain quarries to points at which the material is needed, owners of such quarries can at times find a market for limited quantities of the stone at prices ranging from 3 to 10 cents per cubic meter. In such cases, however, the actual work of the extraction of the stone and its subsequent delivery to the place where required is generally attended to by the purchaser of the stone rather than by the owner of the quarry, and on account of the insignificant value of the material no attempt is made to keep an accurate record of the quantity used. By far the most important item of expense in connection with the use of the stone is that of transportation. The following table of quarries adjacent to the principal public highways already constructed or in course of construction in Porto Rico, many of which are themselves constructed of and upon limestone formations, will serve to illustrate the bountifulness of the supply of lime rock in the island. A list is given of the quarries that have been opened up and from which limestone has been actually extracted. These quarries are grouped according to the highway near which they are located, and their exact location is shown in the first column, which gives the number of kilometers and meters with the equivalent in miles and yards they are distant from the town first mentioned after name of the road at the head of the respective groupings:

Road from San Juan to Ponce.

LOCATION.		Kind of stone.	Owner.
In kilometers and meters.	In miles and yards.		
7.700	4-1,381	White limestone	P. Ubarry.
20.300	12-1,080	Blue limestone	Public works.
25.200	15-1,159	Calcareous	Do.
25.200	15-1,159	.....do	P. Larrosa.
54.900	34-199	.....do	L. Rodriguez.
55.800	34-1,184	.....do	N. Nunez.
61.100	37-1,700	.....do	J. Fernandez.
61.400	38-268	.....do	F. Fernandez.
67.000	41-1,112	Limestone	Heraclio Mendoza.
73.200	45-852	.....do	Public works.
78.200	48-1,040	.....do	Gavino Rodriguez.
84.000	52-343	.....do	Public works.
85.100	52-1,546	.....do	—. Taboada.
87.700	54-870	.....do	Public works.
90.900	56-849	.....do	Dona Paz.
94.200	58-938	.....do	Domingo Emanuelli.
99.500	61-1,454	.....do	Teodoro Santiago.
100.300	62-569	.....do	Julio M. Larrauri.
104.100	64-1,205	.....do	Jorge Velez.
105.300	65-757	.....do	Pedro Quevedo.
106.600	66-419	.....do	C. Caratini.
107.500	66-1,403	.....do	Do.
108.200	67-409	.....do	Remigio Mateo.
111.900	69-935	Blue limestone	José Esbri.
111.100	69-60	.....do	Julian Plaza.
114.300	71-40	.....do	Sucesores Gallart.
120.100	74-1,103	White and yellow limestone.	Manuel Cristian.
125.400	77-1,619	.....do	Sucesores Serralles.
126.600	78-1,171	.....do	Manuel Leon Parra.
126.100	78-624	Blue limestone	Joaquin Arce.
128.100	79-1,052	.....do	José S. Valdes.
129.200	80-495	White and yellow limestone.	José Usera.

Road from Catano to Vega Alta.

6.900	4-506	White limestone	P. Lavandero.
7.900	4-1,600	.....do	A. Santos.
11.600	7-366	.....do	A. Acevedo.
11.900	7-694	.....do	S. Olivo.
13.300	8-465	.....do	
14.900	9-455	.....do	I. Sanchez.
15.100	9-674	.....do	J. Perez.
15.100	9-674	.....do	N. Roman.
15.100	9-674	.....do	L. La Cruz.
16.500	10-445	.....do	S. Martinez.
17.200	10-1,210	.....do	I. Sanchez.
20.200	12-971	.....do	A. Echeveste.
23.300	14-841	.....do	Mr. Miner.
23.700	14-1,279	.....do	Mr. Lothrop.
24.200	15-65	.....do	Mr. Stevens.

Road from Caguas to Humacao.

6.700	4-287	Blue limestone	M. Portela.
7.200	4-834	.....do	F. Echevarria.
9.700	6-48	.....do	T. Hernandez.
11.500	7-257	White limestone	R. Jimenez.
13.200	8-356	.....do	M. Mendez.
14.500	9-17	.....do	Sucesores Farnia.
14.700	9-236	.....do	Sucesores Rodriguez.
16.000	9-1,658	.....do	C. Serrano.
17.450	10-1,484	.....do	Sucesores Rodriguez.
19.500	12-205	.....do	Julio Gay.
22.800	14-294	Blue limestone	S. Rivera.
25.400	15-1,378	.....do	F. Lopez.
25.500	15-1,487	.....do	Do.
28.100	17-810	.....do	Luis Celis.
28.100	17-810	.....do	F. Arroyo.
32.400	20-233	Dark limestone	S. Rocafort.
34.500	21-770	.....do	D. Carmona.

Road from Rio Piedras to Fajardo.

LOCATION.		Kind of stone.	Owner.
In kilometers and meters.	In miles and yards.		
2,200	1-646	Blue limestone	J. Gonzalez.
2,700	1-1,193	White limestone	Manuel Falu.
3,800	2-686	do	E. Gómez.
5,000	3-188	do	E. Van Rhyn.
5,500	3-735	do	José Ubarry.
8,400	5-386	Blue limestone	M. Pérez.
11,100	6-1,579	do	S. de Ezquiaga.
15,100	9-674	do	Francisco Jimenez.
16,200	10-117	do	Basilio Pineiro.
16,600	10-554	do	R. H. Delgado.
18,300	11-653	Yellow limestone	Factoria Central.

Road from Reyes Catolicos Bridge to Corozal.

2,300	1-755	White limestone	I. Sanchez.

Road from Manati to Ciales.

1,400	0-1,531	White limestone	F. Calaf.
8,900	5-933	do	V. Cortes.
10,110	6-496	do	F. Caso.
11,500	7-257	do	Fernández & Co.

Morovis Branch.

3,700	2-526	White limestone	F. Fuxench.
5,006	3-195	do	E. Cacho.
8,000	4-1,709	do	J. Cordero.

Comerio Road.

1,100	0-1,203	White limestone	J. R. Carmona.
2,800	1-1,302	do	M. Ponton.

Road from Cayey to Arroyo.

LOCATION.		Kind of stone.	Owner.
In kilometers and meters.	In miles and yards.		
1,420	0-1,553	Limestone	Joaquin Fernández.
4,000	2-854	White limestone	Public works.
5,000	3-188	do	Do.
8,000	4-1,709	do	Do.
12,000	7-803	do	Do.
14,800	9-345	Limestone	C. Cruet.
23,500	14-1,060	do	F. Ortiz.
28,800	17-1,576	do	Guayama municipality.

Road from Ponce to Adjuntas.

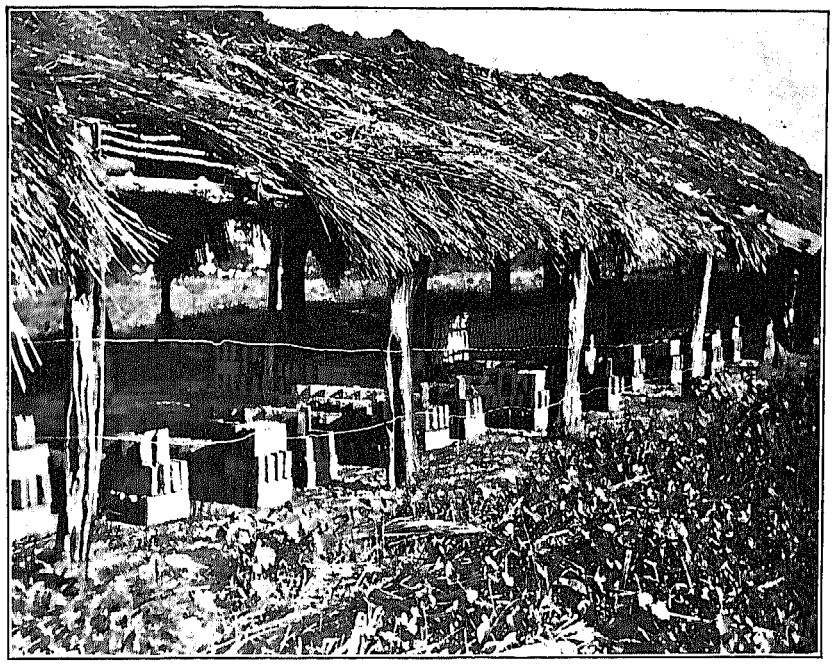
1,500	0-1,640	Limestone	José Irizarry.
2,800	1-1,302	do	Julio N. Chardon.
3,200	1-1,740	do	Do.
3,200	1-1,740	do	Tomás Armstrong.
3,300	2-89	do	Sucesores Chardon.

The statements in regard to limestone preceding the above table apply with equal force to lime in its commercial forms. Practically every farmer in the interior of the island can, and does, produce lime in greater or less quantities, according to his needs, of which no account is kept. A canvass of such persons as could be ascertained to be engaged in the sale of lime in any of its forms gave the results appearing in the following table:

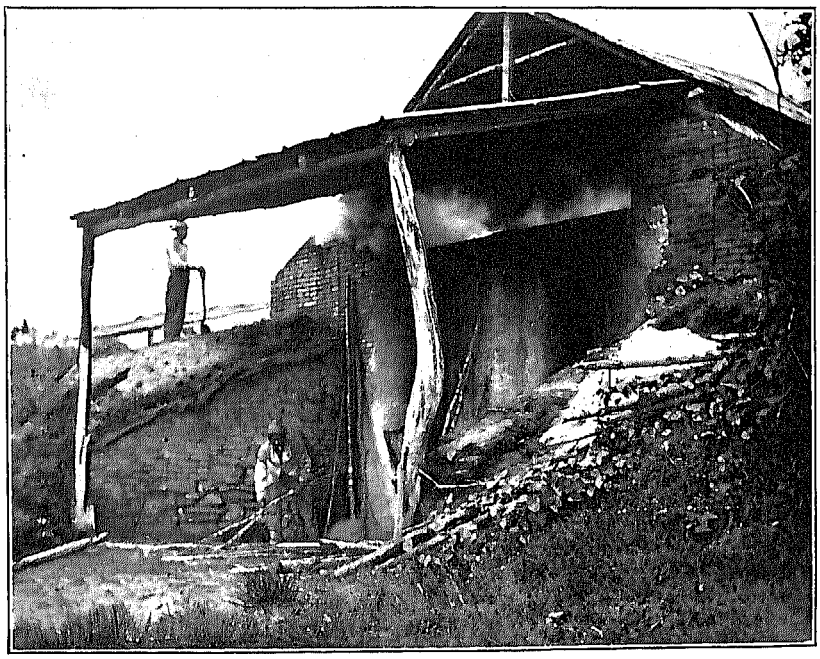
Production of limestone: 1902.

NAME OF OWNER.	LOCATION OF QUARRY.		LIMESTONE QUARRIED.						CRUSHED STONE FOR ROADMAKING.			Total value.	Condition of trade in 1901 compared with 1902.
			For building purposes.			Stone burned into lime.			Quantity—		Value.		
	Department.	Municipal district.	Quantity—		Value.	Quantity—		Value.	In cubic meters.	In cubic yards.			
			In cubic meters.	In cubic yards.		In cubic meters.	In cubic yards.						
Tomás Armstrong	Ponce	Ponce							80	105	$60	$60	About the same.
Victor Martino	do	do	30	39	$90	115	151	$347				437	In 1901 better than in 1902.
Francisco Fiol	do	do							950	1,243	95	95	
Narciso Manescau	do	do	33	43	16							16	In 1901, flourishing; in 1902, dull.
José B. Ortiz	do	do	50	65	15							15	
Trujillo & M. Mercado	do	do				400	523	150				150	In 1901 better than in 1902.
Esteban de Leon	do	do				50	65	25				25	
José F. Valls	do	do				200	262	600				600	Much better in 1901.
Clavell Hermanos	do	do				70	92	210				210	1901 the same as 1902.
Ramón Ortiz Quintana	do	do				20	26	60				60	Much better in 1902.
Jaime Bas García	do	do	50	65	25							25	
Esteban Ortiz	do	do							950	1,243	2,177	2,177	
Carlos Gilot	do	do							915	1,197	2,096	2,096	
Monserrate Ramos	Mayaguez	Cabo Rojo							90	118	248	248	Not operated.
José Villa	do	do							60	78	16	16	Not operated in 1901.
José Ortiz	do	do							40	52	4	4	
Sebastián Bausá	Bayamon	Bayamon							500	654	25	25	1901 the same as 1902.
Juan B. Cesareo	do	do				65	85	26				26	Better in 1902.
Vilella U. Hermanos	Aguadilla	Lares				100	131	50				50	Quarried only 65 cubic yards in 1901.
Emilio Torres	do	do	50	65	25				80	105	40	65	Not operated in 1901.
E. B. Pérez	Mayaguez	Las Marias				77	101	180				180	Do.
F. Philippi	do	do				25	33	100				100	1901 the same as 1902.
Marcos Ortiz	Ponce	Juana Diaz				60	78	240				240	Do.
Cristino Siuró	do	do	[1]15	20	45	60	78	180				225	
C. Dejardins	Mayaguez	Mariano				20	26	10				10	1901 the same as 1902.
Nicanor Santana	do	do				50	65						
José B. Dumont	Guayama	Cayey				15	20	75				75	1901 the same as 1902.
Vicente Vazquez Martinez	do	do				14	18						Do.

[1] For flagging.



PORTO RICO—DRYING BRICKS PREVIOUS TO FIRING.



PORTO RICO—FIRING A BRICK-LOADED OVEN.

Production of limestone: 1902—Continued.

NAME OF OWNER.	LOCATION OF QUARRY.		LIMESTONE QUARRIED.						CRUSHED STONE FOR ROADMAKING.			Total value.	Condition of trade in 1901 compared with 1902.
			For building purposes.			Stone burned into lime.			Quantity—		Value.		
	Department.	Municipal district.	Quantity— In cubic meters.	In cubic yards.	Value.	Quantity— In cubic meters.	In cubic yards.	Value.	In cubic meters.	In cubic yards.			
Eugenio Gómez	Bayamon	Rio Piedras							100	131			
Juan Mollfulleda	do	Carolina				24	31	$58	250	327	$3	$58	Better in 1901.
Eladio Marquez	do	do										3	
Sobrinos de Ezquiaga	do	do				25	33	100				100	Not operated.
Juan Moreno Aviles	Mayaguez	Añasco				60	78						1901 the same as 1902.
J. Sabater Rivera	Guayama	Salinas				350	458	500				500	Do.
Rafael Diaz	Ponce	Yauco				60	78	30				30	
Segundo Castilló	Mayaguez	Mayaguez							239	313	358	358	1901 better than 1902.
Odon Somonte	Guayama	Caguas				80	105	20				20	1901 the same as 1902.
Jorge Bird Arias	Humacao	Fajardo	195	255	$119	25	33	400				519	Demand very small; trade in 1902 about the same as 1901.
José R. Fernández	Guayama	Caguas				80	105	16				16	1901 the same as 1902.
Pablo Ubarri	Bayamon	San Juan	100	131	150				1,200	1,570	1,500	1,650	
Francisco Jimenez	do	Carolina				72	94	90				90	
Santiago Colon	Ponce	Ponce				200	262	150				150	Better in 1902.
Bonifacio Oquendo	Bayamon	Bayamon				150	196	45				45	1901 the same as 1902.
Fernando Salgado	do	do				140	183	42				42	Do.
Ramón Millan	Arecibo	Camuy				300	392	70				70	Do.
Julio N. Chardon	Ponce	Ponce				10	13	25	100	131	10	35	Do.
Ulises Garcia Salgado	Bayamon	Rio Piedras	20	26	40	120	157	940				980	Do.
Eduardo Valdivieso	Ponce	Ponce				100	131	30				30	Dull in 1902.
Segundo T. Fradera	Mayaguez	Lajas				3	4						
F. A. Vendrell	Ponce	Santa Isabel				4	5	4				4	1901 better than 1902.
Juan Valls	do	do				40	52	80				80	Not operated in 1901.
Baldomero Vera	Arecibo	Utuado				20	26	40				40	1901 the same as 1902.
Federico Juarbe	do	Arecibo							61	80	103	103	Not operated in 1901.
José Ubarri	Bayamon	Rio Piedras				20	26	1	100	131	7	8	1901 the same as 1902.
José Castelló	Mayaguez	Cabo Rojo				20	26	20				20	
Guanica Centrale	Ponce	Yauco	5,500	7,194	5,500	500	654	500	[1] 4,500	5,886	4,500	10,500	
Total			6,043	7,903	[2] 6,025	3,744	4,896	5,414	10,215	13,364	[3] 11,237	22,586	

[1] For railroad ballast.
[2] Includes 15 cubic meters (20 cubic yards), valued at $45, used for flagging.
[3] Includes 4,500 cubic meters (5,886 cubic yards), valued at $4,500, used for railroad ballast.

Whenever the demand is such as to make the production of an oven of lime sufficiently lucrative the farmer will prepare one and take it to the nearest market. The production of lime in Porto Rico, therefore, is important rather by reason of the large number of persons engaged therein on a small scale than on account of commercial importance. A certain amount of lime is used by the sugar factories to clarify sirup. In response to interrogatories as to quantity and cost of the lime thus used at the more important factories in the course of a year, the owners stated that where the lime was not to be had on their own premises it was usually obtained from some neighboring deposit gratis.

The limestone formations may be divided into two classes, white and yellow. There are also deposits, few in number, of a blue limestone, somewhat resembling granite formation, and of much harder composition than either the white or yellow varieties mentioned above.

PHOSPHATE ROCK.

There are four phosphate rock mining claims registered in the office of the Commissioner of the Interior of Porto Rico, none of which is being operated at present, viz:

Registered mining claims of phosphate rock.

NAME OF OWNER.	Name of mine.	LOCATION OF MINE.			AREA OF MINE—		Class of mineral.
		Department.	Municipal district.	Ward.	In hectares.	In acres.	
Alfredo Collado	Fortuna	Mayaguez	Cabo Rojo	Monte Grande	6	15	Phosphate rock.
Miguel Arzuaga	La Confianza	Arecibo	Manati	Las Boquillas	6	15	Do.
Joaquin de Alarcon	Trabajo	Aguadilla	Isabela	Arenales Bajos	12	30	Do.
J. Sanchez Valdes	Joachin and San Jose.	Ponce	Ponce		12	30	Do.

There are other deposits of phosphate rock not registered, as shown in the following table, one of which it is claimed produced 50 tons during the year 1902:

Unregistered mining claims of phosphate rock.

NAME OF OWNER.	Address of owner.	LOCATION OF MINE.			TOTAL AMOUNT IN TONS.		Value of sales.
		Department.	Municipal district.	Ward.	Produced.	Sold.	
Domingo Emanuelli	Coamo	Ponce	Coamo	Palmarejo	50	35	$105
M. Porrata Doria	Ponce	do	Ponce	Caja de Muertos			
Fausta Aponte	Coamo	do	Coamo	San Ildefonso			
Miguel Arzuaga	Barceloneta	Arecibo	Manati	Las Boquillas			
José Sanchez Valdes	Ponce	Ponce	Ponce	Machuelo			
Felipe Alfaro	Isabela	Aguadilla	Isabela	Arenales Bajos			

The insular government is the owner of the largest known deposit of phosphate rock, which is situated in the island of Caja de Muertos. This deposit was formerly operated on an extensive scale and the product shipped to Germany. It is idle at the present time, however, pending action by the executive council of Porto Rico upon a franchise to work the deposit, for which application has been made. In statistics previously compiled on this subject, deposits of bat guano have been confused with phosphate rock in consequence of such guano being found upon rocks or in caves of a phosphatic character.

GRANITE.

It is not believed that any real granite is to be found in Porto Rico. Two residents of the central section of the island claiming to have discovered granite on their premises gave the information that only 18 cubic meters (24 cubic yards) had been sold in the rough for curbing purposes and 81 cubic meters (106 cubic yards) crushed for roadmaking purposes. It is probable, however, that the stone in question is of dioritic formation and not granite, as they allege.

MINERAL SPRINGS.

There are four widely known mineral springs in Porto Rico, the waters of which contain medicinal properties of no mean value. They are:

Mineral springs in Porto Rico.

NAME OF OWNER.	Residence of owner.	Date of report.	Name of spring.	LOCATION OF SPRING.			Remarks.
				Department.	Municipal district.	Ward.	
Sucesión Usera	Coamo	June 4, 1903	Coamo, Maria	Ponce	Coamo	San Ildefonso.	Used only as baths.
Virella U. Hermanos	Arroyo	do	Carmen, Dolores	Guayama	Arroyo	Algarrobo	Do.
Guillermo Orrach	Caguas	do	Florencio	do	Caguas	Bairoa	Do.
Sucesión Ortiz	Ponce	May 22, 1903	Quintana	Ponce	Ponce	Portugues	Do.

The first-named spring is famous locally as a health resort, there being a well-appointed hotel furnishing accommodations for 110 guests. The waters are supplied to visitors in the form of hot and cold baths and for drinking purposes, but have never been bottled, nor has any attempt been made to put them on the market. The springs run from a soft red sandstone, at an altitude of 196.85 feet above sea level, with a temperature, at point of exit, of 43° C. An analysis by Quintanilla in 1891 gave:

Gases in solution, per liter of water at 0° C. temperature and 760 millimeters pressure:

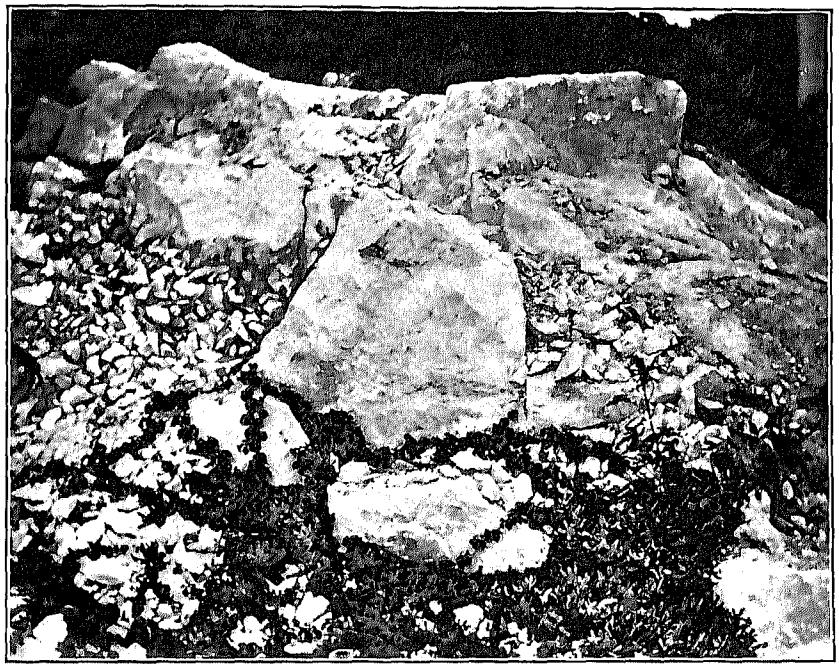
	Cubic centimeters.	Cubic inches.
Nitrogen	13.740	0.84
Oxygen	1.761	0.11
Hydrogen sulphide	1.967	0.12

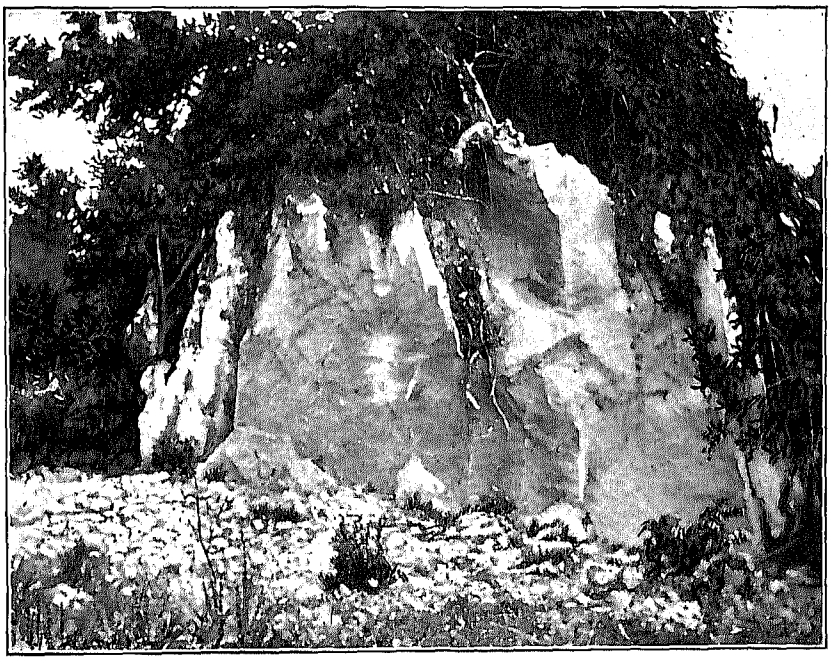
Fixed elements, per liter:

	Grams.	Grains.
Free carbonic acid	0.01296	0.20000
Sulphate of lime	0.79903	12.33063
Sulphate of soda	0.52531	8.10658
Chloride of potash	0.00031	0.00478
Chloride of sodium	0.22054	3.40337
Silicate of soda	0.08127	1.25416
Carbonate of soda	0.03503	0.54058
Ferrous carbonate	0.01114	0.17191

Traces of tannic, nitric, and boric acids and bromine and lithia.

The Florencio springs are not operated for the benefit of the public. There is a private bath house used by the family of the proprietor and by other persons by special permission. The waters have never been bottled nor put on the market. The proprietor states that local physicians prescribe the waters for skin diseases and stomach troubles, but that a scientific analysis has never been made.





PORTO RICO—LIMESTONE QUARRIES.

The Quintana springs, near the town of Ponce, are also quite extensively known locally as possessing excellent medicinal virtues. The waters are administered in the form of baths, but within recent months, owing to the bad state of the road leading to the baths and the abandoned condition of the establishment itself, the springs have ceased to be a public resort. An analysis made in San Juan in 1894 classifies the water as colorless, odorless, transparent, salty, and somewhat bitter in taste; no matter in suspension; density, 1.0057.

Gases in solution:	Cubic centimeters.	Cubic inches.
Ozone	0.0191	0.0012
Oxygen	0.0100	0.0006
Carbonic acid	0.0025	0.0002
Fixed elements, per liter:	**Grams.**	**Grains.**
Chloride of sodium	0.519	8.009
Chloride of magnesia	0.015	0.231
Sulphate of soda	0.123	1.898
Sulphate of potash	0.021	0.324
Sulphate of lime	0.081	1.250
Carbonate of lime	0.122	1.883
Ferrous carbonate	0.012	0.185
Silica	0.032	0.494
Organic matter	0.050	0.772

Traces of manganese and bromine.

The Arroyo springs are not operated by the proprietors, who state that no trustworthy analysis of the waters has as yet been made.

Accompanying this report is a map showing approximately the location of mining claims, salt deposits, and mineral springs in Porto Rico. Owing to the fact that no scientific triangulation or survey of the island has ever been made, it has been impossible to indicate on the map with exactness the geographical position of these claims. It is believed, however, that the general purpose of showing the approximate location of the mining deposits of Porto Rico is sufficiently well served. The reason given above with respect to the want of exactness in the location of mining claims applies to the boundaries separating municipalities as well.

Every effort was made to obtain data showing the number of persons employed during the year in the exploitation of the mineral resources of the island. For obvious reasons such an effort could not meet with any great degree of success. As has been stated, in no case were mines or quarries operated during the year as a continuous industrial enterprise. Even in respect to such work as brickmaking, lime burning, or quarrying, operations were of an intermittent character. As regards quarrying, the rock was usually taken out by the contractors engaged upon road construction or repair in connection with their other work. No amount of research, therefore, would have permitted a definite statement either of the total output or of the number of persons employed. The best that can be done is to make a rough estimate, based upon the general information secured, in obtaining the data for the report of the probable average number of persons that may be said to have gained a livelihood in some capacity in connection with the exploitation of the mineral resources of the island.

In respect to the extraction of precious metals, a fair estimate would put the average number of men constantly employed during the year in exploitation work for gold mines and the laying out of claims and similar work at twenty-five. Thirty additional men were probably employed in placer mining, chiefly in the Corozal district. Exploitation and field work in connection with copper mines probably did not engage more than ten men. About one hundred and fifty men may be said to have been constantly employed in the operation of salt mines. Brickmaking probably gave employment to an equivalent of two hundred men working all the year. Estimating from the amount of limestone extracted for the purpose of roadmaking and repairs and for burning, an exceedingly rough approximation would place the amount of labor expended in limestone quarrying operations at five hundred men. As only 50 tons of phosphate rock were mined during 1902, probably not more than two or three men had constant employment during the year.

That Porto Rico possesses mineral resources that will be of great value to the island in future years there can be no doubt. In their utilization the stage as yet has only been reached where efforts are being made to determine more exactly their character and extent. Authorization for water rights and concessions of various characters are being constantly sought of the insular government, and it is certain that when another investigation along the lines of the present one is made the phase of industrial exploitation in respect to a number of minerals will have been definitely entered upon.