

philippine studies

Ateneo de Manila University · Loyola Heights, Quezon City · 1108 Philippines

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Philippine Studies vol. 13, no. 4 (1965): 763–800

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Fri June 30 13:30:20 2008

Eighteenth Century Philippine Economy: Mining*

MARIA LOURDES DIAZ-TRECHUELO

IRON MINES AND IRONWORKS

IN the beginning of this study we briefly mentioned the mineral resources of the Archipelago which were known by the second half of the eighteenth century. We shall now consider their development during the period 1750-1800, narrating the ventures undertaken and their results.

The iron mines of the country drew the attention of the Governors. They were aware that a systematic exploitation of the iron ore, that was of such abundance, would check the outflow of significant quantities of silver spent yearly in the purchase of iron. Its usefulness both in times of war and peace can be seen from the variety of its products: ordnance and bullets, anchors and ship-nails, ploughs, "*cauas*", "*carajais*,"¹ and other essential objects of daily use.

From about the middle of 1734 to the end of 1751, the amount of iron imported came to a volume of 99,512 *arrob*as, 12 lbs., 8 ounces, giving an average yearly import of 5,379

* This is the third of a series of five articles by Miss Díaz-Trechuelo. It is translated from the Spanish by Angelita Q. Yap.—
EDITORS' NOTE.

¹The "*cauas*" or "*caguas*" were cauldrons or kettles imported by the Chinese. The *carajay* "is a frying-pan native to the country used

arrobas. This iron coming from Europe, Vizcaya, China, Bengal and Siam varied in quantity and price. The greater part, which amounted to 85,198 *arrobas*, 5 lbs., 8 ounces, came from the mines of Vizcaya and Europe. A noticeable difference in the volume of imports from the other countries is shown in the following figures: China—6,911 *arrobas*, 19 lbs., 14 ounces; Bengal—5,084 *arrobas*, 13 lbs., 2 ounces; Siam—2,317 *arrobas*, 24 lbs.² The thousands of pesos consumed in this manner explain why the iron deposits were objects of continued and systematic development. Although, there were also attempts to make the other mineral resources productive, like gold and copper, as well as sulphur, saltpeter, quicksilver, and tar.

The Mines of Mambulao

Among the first iron mines to be developed were those of Mambulao in the Province of Camarines Norte. It was during the administration of the Governor, Sabiniano Manrique de Lara (1653-1663) when an iron mine in Paracale was discovered by the *sargento mayor*, Don Juan de Berastain. The Governor regarded this of great consequence and did not hesitate to offer every assistance. Berastain started operations in the mine, but failed to get substantial results. The Governor decided then that the government assume direct control of the project through the *alcalde mayor* of Camarines province, Andres de Rojas. But neither did this change in man-

for the cooking of nearly all kinds of dishes." Cited in W. E. Retana, *Diccionario de Filipinismos con la revisión de lo que al respecto lleva publicado la Real Aademia Española*, extracted from *Revue Hispanique*, vol. LI (New York, Paris, 1921). The *Diccionario* of Buzeta y Bravo explains: "Carajais: the frying-pans used in Europe are known by this name in the Philippine Islands; nevertheless, they are of a different make and shape. This is one of the items introduced by the early Chinese who settled in the Archipelago. Because of this they were also the ones who engaged in its manufacture and its import from China."

² Report of the *oficiales reales*, 20 December 1753, included in the "Testimonio auténtico del expediente formado sobre erigir y volver a establecer el real de minas de fierro de real cuenta en Mambulao, pueblo de Paracali, en la provincia de Camarines. 2^a. via. 1754," folio 62, in the Archivo General de Indias (hereafter AGI) *Filipinas* 468.

agement effect the expected production. This made Manrique de Lara realize later that the failure was due to the lack of iron masters in the work.³ His successor, Don Diego Salcedo, sustained these efforts, and when a certain *capitán* Gil Carol, an experienced mining engineer from Spain arrived in Manila, he took advantage of his presence and asked him to direct the work in the mine in 1663. After two years Carol extracted 215 quintals, 3 *arrobos* of pure iron.⁴ With these results, Salcedo submitted the matter for the deliberation of the *Junta de Hacienda* which met in Manila in June of 1665. They agreed unanimously to proceed with the exploitation, although the ore yield at the time was not too encouraging. The mineral was of inferior quality, losing 50 percent in its extraction. The repeated failures caused the abandonment of the mine in 1669.⁵

The work at the mines in Mambulao did not resume till 1696, that is, twenty-seven years later, when a miner, Don José Rojo Briones, who was exploiting nearby iron deposits on his own, asked the Governor for the use of the water reservoir, the ruined house and ironworks to smelt the iron ore that he extracted.⁶ On September 13 of the same year, the Governor, who was then Don Fausto Cruzat y Góngora, gave him full authority to operate the Mambulao mines.⁷ This end-

³ *Junta de Hacienda*, Manila, 1 June 1665, fol. 2-11, *ibid.*

⁴ "Memoria presentada por el *capitán* Gil Carol", fol. 6v-8v, *ibid.*

⁵ Report of the *oficiales reales* to the Governor, Manila, 10 November 1692. The salaries of the superintendent of the mines and the people who were supposed to be employed continued to be paid. The report inquires whether these should be terminated. Folio 12, AGI *Filipinas* 468. On 11 November 1692 the Governor, Fausto Cruzat y Góngora decreed such action, ordering that all the "goods, munitions and ordnance" that were in the mines be released to the royal warehouses in Manila. Folio 14, *ibid.*

⁶ Petition of Juan de Garaycochea, undated, representing Rojo Briones. By a decree of 3 April 1699, the Governor granted the request. Folio 16v, *ibid.*

⁷ This date brought the transfer into effect, Rojo Briones being given specific charge of "a house with stone walls, floorboards, tile roof, wooden partitions, all in dilapidated condition but for the walls; it measures 10 fathoms in width, 20 fathoms in length, and 7 yards in height; some stone walls without a roof serve as the foundry, which has

ed the direct government control of the mines, a situation that lasted till the beginning of the second half of the eighteenth century. This is where we approach the proper subject matter of our study.

The Marquis of Obando, whose administration (1750-1754) was so outstanding in whatever pertained to the development of the rich resources of the Archipelago, realized the abandoned state of the Mambulao mines. He sent *fray* Sebastian de San Vicente of the Augustinian Recollect⁸ who was a master in the art of iron smelting, and "who knew the methods of iron mining followed in Vizcaya",⁹ to do a survey of the area. An illustrious resident of Manila whose name is always associated with the economic development of the country volunteered to finance the venture. This was Don Francisco Xavier Salgado, a man of enterprise so rarely found in the Philippines then, who, Obando praised as "a person in whom gather together the admirable qualities of faithfulness, dedication, and efficiency".¹⁰

Salgado and *fray* Sebastian, together with two *sangleys* who were master founders, fourteen skilled carpenters, smiths, and colliers, left Manila on April 1753. They took a land route to the town of Mauban in Tayabas from where they sailed to the island of Alabat which was inhabited only by wild tribes of Negritos. They reached the island on the eighth of May but the poor health of *fray* Sebastian whose chronic asthma ail-

three partitions made of the same stone material, each part has two rooms measuring 22 x 16 x 5 yards; on the front elevation of the house is a stone fortification extending as far as the sea, the tower measures 40 yards in circumference and 10 yards in altitude . . . likewise, the use of the water reservoir which is in Calogcog towards the south." Folio 24, *ibid*.

⁸ Decree of Obando, Manila, 10 April 1753, fol. 29, *ibid*.

⁹ Salgado to Basco, San Jacinto, 2 September 1781, included in "Testimonio del expediente sobre el beneficio y cultivo de la canela por Don Francisco Xavier Salgado," accompanying the letter of Basco to Gálvez, Manila, 15 May 1782, AGI *Filipinas* 723; published in *Anales de la Real Academia de Farmacia* (hereafter *ARAF*), no. 2, 1951, pp. 173-189.

¹⁰ Decree of Obando, Manila, 10 April 1753, fol. 29, AGI *Filipinas* 468.

ment recurred during the difficult trip, forced them to return to Mauban. There, he was placed under the care of the Franciscan friars who restored him back to health. Meanwhile, Salgado sent in his best ships the two *sangleys* and three Spaniards to inspect the site of the iron mine, to set its boundaries accurately and also to take samples from different parts to determine its quality. After eight days, on May 18, they returned with a rough sketch of the site (Plate I), and brought with them as sample about ninety quintals of iron ore taken from the surface. The sketch showed that the mine was located on an island close to the town of Mambulao. The extraction of the iron ore which was in the form of loose stones was easy and economical as was its transport to the town. The proximity of the mine to the coast facilitated the loading of the ore on boats. The distance to that place where Salgado thought the foundries should be mounted was as short as from Manila to Bancusay, and the navigation was easy. For this reason, the transport of each picul of mineral would only cost a half rial. The other advantage of this site was the abundance of mangrove trees which in the Philippines were the source of valuable charcoal used in foundries. There was already a dam which was constructed at the time of the first exploitation of these mines. This would facilitate the installing of a drop hammer and of bellows. Salgado estimated that the mounting of the foundry would not cost fifty pesos.

However, the distance of Mauban from Manila and the difficulties of the trip offset the advantages. To ship the iron to Manila meant bringing it to Mauban on a waterway made difficult by contrary winds and a rugged coastline. Then it had to be taken to Laguna de Bay by land through impassable roads, loaded on carabaos which could carry only one picul each. When it finally reached Manila, transportation costs amounted to about twelve rials each picul.

Similar difficulties were encountered in supplying the miners with provisions and tools. The land being poor and sparsely populated, its inhabitants were not inclined to agriculture but were solely interested in panning gold from streams, and lived day to day from what nature readily offered.¹¹

¹¹ Manuscript of Salgado, AGI *Filipinas* 723.

The first smelting test made in Mauban following the Chinese method made use of two piculs of iron ore, the equivalent of about 11 Spanish *arrobas*, which yielded 22 lbs. of pure iron in various sizes of bars. Much later in Manila, it was described by the master of the *Real Herrería* as "good iron which was malleable and suitable for varied uses".¹² Another test made by *fray* Sebastian to smelt iron using European techniques was a complete failure since the forge was damp and the bellows did not function well, and what turned up was crude ore covered with slag. Salgado then decided to return to Manila, bringing eight loads of iron ore for experimentation under better conditions. There he had them smelted using the Chinese process again, and from one *arroba* and 12 lbs. of iron ore was extracted 14 lbs. of gross metal. This, when purified in the government foundry, was reduced to 6 lbs. of pure iron, showing that the yield was a sixth part of the original ore. The experiment of *fray* Sebastian in Manila using the Spanish method gave a similar result, obtaining 1 lb. of pure iron from 6 lbs. of the mineral.

Salgado, anxious to promote this industry, made on his own two explorations. Upon his return to Mambulao, he sent *fray* Sebastian and the two Chinese master founders to survey some mountains near Cabinti in the vicinity of Laguna de Bay. But they found only a negligible amount of the mineral which discouraged them from further explorations.

Meanwhile in Manila, the Dominican, Fr. Juan de la Cruz, notified Salgado of a hill with an iron vein located in the missions of Bamban, Pangasinan, about fifty leagues from Manila. Salgado lost no time in sending there the two *sangleys* accompanied by a Spaniard. The expedition lasted for two months during which they painstakingly surveyed the sites mentioned by the missionary in the mountains of Buhay, but found no trace of ferrous minerals. The expedition cost the life of one of the Chinese smiths.¹³

Salgado kept searching for other mines more conveniently located than those of Mambulao whose distance from Manila,

¹² Report of Salgado, Manila, 5 November 1753, fol. 49, AGI *Filipinas* 468.

¹³ *Ibid.*, fol. 55.

as we noted, was considerable and difficult. The exploitation of iron deposits which required the transport of foods, iron tools and other things made it imperative to open land routes as regular access to the mines. As they experienced, the trip by water from Mauban to Mambulao was extremely dangerous.¹⁴

Obando, aware of these difficulties, passed a decree on 5 December 1753 ordering the *alcaldes mayores* of the Provinces of Tayabas and Camarines to open the necessary roads to facilitate the trip to Mambulao, asking them to draw up a plan and map of the roads to be submitted to him.¹⁵

Salgado offered to develop the mines at his own expense, and to deliver 2,000 piculs of iron annually to the government warehouses.¹⁶ This meant for the royal treasury a saving of 12,000 pesos. In exchange, Salgado requested that he be permitted to make a shipment of 2,000 piculs of iron as ballast in the galleon to Acapulco. That if in any year a ship is lost, that he could double this amount in the following year. Also, that the proceeds of his sales be returned to Manila, paying in Acapulco a 5 percent duty.

Another condition that Salgado proposed was that his lease of the coco and nipa wine monopoly be extended for another six years, without a new bidding. This was presented to the *Junta de Real Hacienda* with a report of the *fiscal*. The *Junta* agreed to concede him the extension, but with an auction to take place. This so annoyed Salgado that he withdrew his proposals. Obando, believing that the development of the iron mines was reason enough to accept the terms of Salgado, revoked the "bidding" clause, following the advice of his counsel, Don Domingo de Neyra.¹⁷ Salgado's proposals were therefore accepted. However, Obando's decision did not take effect; on the contrary, by the royal *cédula* of 7 March 1756, the provisions of the agreement were an-

¹⁴ *Ibid.*, fol. 51.

¹⁵ *Ibid.*, fol. 58v.

¹⁶ *Ibid.*, fol. 89.

¹⁷ Report of Domingo de Neyra, 9 May 1754, fol. 196v., AGI *Filipinas* 468. By a decree of 10 May 1754 Obando granted the extension of Salgado's lease under the specified terms, fol. 202, *ibid.*

nulled, and an order given that the contract of the coco and nipa wine monopoly be placed on auction.¹⁸

Furthermore, the section of the agreement dealing with the operation of the Camarines mines was also nullified, and a provision made that its appropriation be submitted to bidding. Should the case arise that the mines remain unleased, they would be turned over to a "subject who can operate them, granting him all the privileges set down in the *Leyes y Ordenanzas*." Such a resolution followed no doubt the letter of the law, but revealed ignorance of the actual conditions in the Philippines. Already the brief account of the exploitation of mines sufficiently tells the difficulty of finding persons who would undertake such ventures.

However, before the royal *cédula* was received in Manila, Salgado had started the work on the mines of Mambulao in June 1754. A month later Don Pedro Manuel de Arandía succeeded Obando as Governor of the Philippines. Salgado, however, did not remain in Mambulao since its distance of 70 leagues from Manila incurred a high cost of transportation. The mine was also situated in a town frequently attacked by Moro pirates who set it on fire twice. This persuaded Salgado to search for other mines which were better located. His efforts were rewarded when in the mountains of San Isidro, near the valley of Lanatin, he found rich iron deposits. He notified Arandía of his claim, and sought permission to leave the Mambulao mines, to begin the exploitation of the new mine. The permit was granted him.

The Mine of Santa Inés

The site of this mine in the Province of Tondo, about eight or nine leagues from Manila, was highly advantageous. The valley of Lanatin is situated between two mountain ranges, running almost parallel from northeast to southwest to the hill of San Andres. There the valley ends where the ranges turn south. In the extreme northeast they form a narrow ravine where a river descends crossing the valley. Its ample irrigation makes the valley rich and fertile. The river, called Ta-

¹⁸ AGI *Filipinas* 882.

may, carried even during the dry season sufficient water to move any type of hydraulic machine of that period with the use of a dam. Although, during the rainy season its waters and the strength of its currents greatly increased, the terrain prevented its overflow. The valley, with its favorable climate and fertile lands was suitable for settlement. It had forests for the breeding of livestock, farmlands, and an abundance of building materials, gravel, lime, clay and sand for the making of bricks and tiles, and a variety of timber.

The iron mineral was found in the surrounding mountains. It was in the form of loose stones of various sizes, "from the size of a pine nut seed to all sorts of dimensions."¹⁹ Its metal content yielded 75 percent pure and refined iron. The cost of transporting it to the ironworks was low, since there was a natural ridge through which it could be brought down close to a furnace. Salgado himself said that each load of ore weighing 5 1/2 *arrobas* cost only one silver rial in its transport.

The prerequisites for a successful exploitation were present. The problem offered by poor roads that made it difficult to reach the docking place could be remedied, and was something Salgado intended to solve on his own had he not met with Arandía's apathy. Early in 1758, Salgado contracted Chinese master workmen to manufacture ordnance, anchors, and other tools. These *sangleys* were pagans, objects of expulsion proceedings under the terms set by a royal decree. Arandía, privately and by word of mouth, authorized their entry into the country, so Salgado claimed; subsequently, Arandía officially denied having done so. This incident and Arandía's uncooperative attitude caused Salgado to suspend operations of the mines in December 1758.

By then he had invested close to 50,000 pesos in searching for iron deposits, clearing roads, constructing lime-kilns, making tiles and bricks used in the building of houses and warehouses, and other objects needed in operating the mines. He also had to bring in from China, master founders and skilled work-

¹⁹ Report of Salgado, 9 April 1760, fol. 4v-12, accompanying the letter of the *interim* Governor, Bishop Ezpeleta of Cebu to Arriaga, Manila, 17 July 1760, no. 16, AGI *Filipinas* 680.

men since these were not available in the Philippines. More than three hundred men, natives and *sangleys* were engaged in operating the mines and the ironworks. To these were added those assigned to transport the ore together with those who brought provisions to the mining town.

During the four years of his management, Salgado succeeded in extracting a total of more than 4,000 piculs of iron, of which 3,000 were in small bars and the rest as bullets, ploughs, and other pieces of cast iron. The Chinese method was adopted in the smelting process. This consisted first in obtaining iron plates which are heated to form small bars measuring a palm's length and 2 or 3 fingers in width on all sides, each weighing six to eight pounds. The quality of metal thus produced was excellent, its one drawback being that since it had not been beaten with a hammer as in the European method, it was less compact. To remedy this, Salgado had planned to install a drop-hammer and had already collected the materials for the needed dam on the river.²⁰

Determined not to continue his mining operations without the help of Chinese master workmen, Salgado left the dwellings and warehouses of his ironworks under guard, in the hope that another Governor, recognizing its value and importance, might wish to re-establish it. This came about during the governorship of Archbishop Manuel Antonio Rojo who expressly sent for Salgado to tell him that he not only was authorizing the entry of *sangley* master workmen, but also extending him whatever help he would require to continue his mining enterprise. By then, Salgado had lost interest, and offered instead to turn over to His Majesty all the rights together with the buildings and machineries he had installed in the ironworks to be administered either by the government or by an interested private company.²¹

Three men presented themselves, Don Juan Francisco Solano, Don Juan de Asso y Otal and Don Francisco Casañas, to whom was given the lease to develop the mines and ope-

²⁰ *Ibid.*

²¹ Salgado to Basco, San Jacinto, 2 September 1781, AGI *Filipinas* 723.

rate the ironworks for nine years. The lease was five hundred pesos yearly with the obligation to supply the government two thousand piculs of iron with a discount of one peso per picul on the current price. The first two of these leaseholders were commercial entrepreneurs and residents of Manila. In 1773 they financed the voyage of the *fragatilla, Buen Fin*, which as we have seen²² succeeded in reaching Acapulco after many perils following the new route between the southern extremity of Mindanao and the northern points of New Guinea.

With the approval of the leaseholders, Archbishop-Governor Rojo appointed the military engineer of Manila, Don Miguel Antonio Gómez²³ as Intendant of the mine to supervise the manufacture of ordnance, mortars, bullets, bombs, as well as anchors and nails vitally needed for the Cavite shipyards. Gomez moved to Santa Inés in January 1762 where he first worked on setting up two lime-kilns and one for brick and tiles to repair the ruined buildings. This preliminary work was completed by the end of March, and around the ironworks a new settlement grew up. There were 150 nipa houses which served as dwellings of the workers. The foundry soon began to function. More charcoal furnaces were put to use. These supplied fuel to two new smelting forges, one refinery forge, two furnaces of the reverberatory type. Charcoal was likewise supplied to one forge for iron implements used in the mine, one for nails and another for platen. Later a forge for bullets and grenades was repaired.

From the first of March to the sudden invasion of the British in 22 September 1762, which interrupted the work on

²² See "Dos nuevos derroteros del galeon de Manila (1730 y 1773)," *Anuario de estudios americanos* XIII (Seville, 1956).

²³ The Intendant had a monthly salary of 100 pesos, and his assistant, 25 pesos monthly. He also had the following personnel with the respective salaries: a chaplain with a yearly stipend of 200 pesos; manager, 15 pesos monthly; one watchman, one clerk, 2 foremen, each person paid 6 pesos monthly; one cook, 4 pesos monthly; 4 servants, each paid 2 pesos, 6 rials monthly. The salaries and maintenance of this group are drawn from the accounts of the contractors; the Intendant's salary is paid by the royal treasury. Report of Miguel Antonio Gómez, Santa Inés, 9 September 1762, accompanying the letter of Anda to Arriaga, Manila, 15 January 1773, fol. 3v-15, AGI *Filipinas* 882.

the mines, the production was as follows: 2,500 ploughs, 16,000 bullets of various calibres, 4,000 grenades; 650 metric quintals of iron beaten into balls of a quality similar to those of China; 400 quintals of platen like that of Europe; 150 quintals of ship-nails of all sizes; another 150 quintals used in the manufacture of mining equipment. At the same time a new foundry with 20 forges was nearing completion.

The war completely razed the iron works to the ground. The natives in uprising, plundered and set on fire the mine, the buildings, the town and killed nine master-founders. The losses suffered by the leaseholders was calculated at about 18,000 pesos fuertes.²⁴

*The Administration of Anda y Salazar and
the Resumption of Mining Operations.*

When Simón de Anda y Salazar was appointed Governor in 1772, he already knew from his own experience in the country the significance to the Philippine economy of the mining industry. So when he left for Manila, Anda brought with him two master smiths as well as some equipment, an anvil and a drop hammer. In this manner he hoped to introduce the European method of mining and working the foundries. As soon as he arrived in the Philippines, he gave orders to send for 72 master founders and skilled workmen from China, the cost to be defrayed by the government. But the death of the two Spaniards and other adverse circumstances hindered the growth of the enterprise. This frustrated the ambitious plans of Anda. In a letter to Arriaga²⁵ he spoke of his plans to develop a mining industry and how he had ordered the search and exploitation of new iron deposits. He hoped to produce enough iron to arrest the importation whose yearly cost has risen to 100,000 pesos. He also expected to compete with the French who were exporting to India and the neighboring countries iron obtained from the island of Mauritius. Compared to Philippine ore, this was coarse and inferior in quality. To develop the iron indus-

²⁴ Gómez to Arriaga, Malaca, 29 July 1763, AGI *Filipinas* 681.

²⁵ Anda to Arriaga, Manila, 15 January 1773, no. 275, AGI *Filipinas* 882.

try on a large scale, Anda requested that other master workmen be sent from Spain to replace the two Spaniards who died shortly after their arrival in the country. He also asked for equipment that was needed.²⁶ All these he asked in the form of economic aid since the coffers of the colony were found, as was their usual state, incapable of supplying the amount of 175,000 pesos that the budget of the plan required.

To describe the details of his plan, he enclosed the report of Miguel Antonio Gómez, illustrated by three charts. One of them (Plate II) shows the position of a hill with the richest iron vein (marked no. 15) found entrenched in layers of red-yellowish soil, and appears in stone formations of varied sizes and shapes, weighing from one ounce to more than two *arrobas*. This vein extends from the hill of San Andres to the neighboring hillsides, and follows the course of the river upstream, where huge blocks of ferrous stones are found. Although according to experts, these were not beneficial since they contained a good deal of copper.

The mine at the crest of the hill indicated, could easily be exploited at the cost of 4 *granos* per picul in its extraction.²⁷ When Gómez wrote this report there were already three smelting furnaces, two for refining, and two reverberatory furnaces which were used to break the heated ore into pieces before it is thrust into the forge. Two other small furnaces were used to heat iron sheets before they were placed in the refining furnace.

A large shed was built for three forges, one to repair iron tools used in the mine, the second to make platen or iron sheets, and the third to make small nails. There was also a large foundry with 18 forges which was about to start the man-

²⁶ "Copper tuyere, hammers for working square iron, metal sheets, mallets, and other implements necessary for the purpose." AGI *Filipinas* 882..

²⁷ Report of Gómez to Rojo, Santa Inés mines, 9 September 1762, presented in the "Testimonio literal del expediente creado sobre el reconocimiento e inspección de creaderos de venas, rios y sitios ventajosos para el establecimiento y fabrica de Ferreras," accompanying the letter of Anda to Arriaga, Manila, 15 January 1773, no. 275, AGI *Filipinas* 882.

ufacture of nails for the Cavite shipyards, where a frigate was being constructed at the time. The charcoal used to fuel these furnaces amounted to 5-1/2 *arrobas* whose cost locally was two rials *unidad*.

Six ironmasters, each assisted by 4 skilled workmen carried on the work at the foundry without interruption day and night. There were also 2 refinery masters, each with 4 assistants, two persons with their respective helpers casting bullets and ploughs, 6 smiths, and various unskilled laborers. All these workers, being Chinese, tenaciously used their own method of extracting and processing the metal. They could not be persuaded to adapt the European method which would have given greater results.

A charcoal mill was installed next to the ironworks to supply the fuel of vegetable charcoal. Its 204 kilns produced 4,000 piculs daily. The work was done by native laborers from Cagayan, numbering about 300. To these must be added carpenters, loggers, lime-makers, tilemakers and unskilled laborers who worked on constructions.

In January 1773 Anda sent a dispatch to Arriaga giving an account of his plans to locate iron mines, advantageous sites for the ironworks, and to erect factories for the manufacture of anchors and ordnance, for which there was a growing need in the Philippines. The engineer, Miguel Antonio Gómez was asked to organize these projects, and to plan the building of a factory for cast iron.²⁸ To prepare himself he studied a work of Pedro Bernardo Villa-Real de Beatriz on "Hidraulica de Ferrerias," which served to help him calculate the measurements of dams, 26 feet in height and to make an estimate of the thickness of the masonry as was necessary to withstand earthquakes. To plan out the factory for the manufacture of anchors, he followed the method of M. Reaumur presented to the Royal Academy of Sciences of Paris in 1723, with the supplementary remarks of Duhamel. Gómez did not find satisfactory sources on the manufacture of ordnance, of which he himself admitted, he knew nothing. Although he

²⁸ Gómez sent the plans with a covering letter, Manila, 16 January 1773, AGI *Filipinas* 882.

had "more than moderate knowledge" with regard to the manufacture of ploughs and intricate works of cast iron which he acquired from experience while he supervised the ironworks of Santa Inés.

In May of 1773, the Chinese master founders, skilled workmen and smiths that Anda sent for had arrived in Manila.²⁹ As a first measure taken, the Governor asked them to test some samples of iron ore that he ordered from Angat, in Bulacan. The experiment which was conducted in his presence yielded metal of the best quality. Thus, he decided to send Gómez with eight Chinese master workmen to examine the rich mine. They reported that in spite of the abundance of the mineral, and of timber, the location of the mine like those of Laguna was not actually favorable; that after the season of heavy rains, it was possible to begin the construction of the ironworks. The site chosen was close to the Tanay river. In early 1773, the Governor together with the engineer Dionisio O'Kelly and the official treasurer José Antonio de Larzábal visited the site and found it appropriate for the ironworks.

In order to save time, Anda thought of installing a foundry like the type used in China to start the exploitation for which he required only about 20,000 pesos. Meanwhile, he would wait for the economic aid he had requested from Spain to mount a foundry adapting the Vizcayan process.

The Governor described the discovery of these mines in his letter dated 1 January 1774³⁰ to the Consulado of Manila hoping to interest them in the project. To this effect, he ordered a series of tests to compare the mineral extracted from the Santa Ines mines to that from Marula, less than a league distance from Tanay. These experiments were done in Manila from December 21 to 24, 1773 during which time 220 *arrobos* of mineral were processed. After sifting and washing, the mineral was reduced to 180 *arrobos*. When heated for 96 hours, it gave 72 sheets of cast iron weighing 69 *arrobos*, 18

²⁹ Anda gives an account of this and what follows to Arriaga in a letter of 20 June 1773, no. 303, AGI *Filipinas* 882.

³⁰ This matter is referred to in a letter, no. 367, and in another to Arriaga, 7 July 1774 No. 377, AGI *Filipinas* 882.

pounds. In the refining process which took 30 hours, 270 small bars were obtained weighing 54 *arrobas*, 21 pounds.

Comparing these results with those of the tests done with mineral extracted from the Santa Inés mine in 1762, it was demonstrated that the iron of Santa Inés was richer. One furnace there working for 24 hours produced sheets of cast iron weighing 31 *arrobas*, 17 pounds, which meant an annual production of 2,890 quintals, 3 *arrobas*, 5 lbs. of iron. This was the yield of just one smelting furnace. If at the time there were enough master founders and skilled workmen to keep three furnaces working, the annual production of the Santa Inés mines would have gone up to 8,672 quintals, 1 *arroba*, 15 lbs., while the Tanay mines under similar conditions would yield only 4,380 quintals yearly. The tests made with the iron mineral of Simbacan and Hamosavan gave similar results.³¹

All this information was remitted to the Council of the Indies. In turn the matter was submitted to the *Contaduría* which found it imperative to support the measures taken realizing the importance of the mining industry. It also deemed it worthwhile to approve the request of Anda that the Consulado of Manila take charge directly or through one of its members, of the exploitation of the mines. For his part, the *fiscal* suggested that the technical experts Anda asked for should be sent at the expense of the government; that if this is not possible, the mines should be leased to Don Diego de Horcasitas, the only Spaniard who submitted a bid according to the communication of the Governor.³²

But apparently, this remained on paper. For when Basco took over the administration of the Philippines, in compliance

³¹ Annotation that accompanied a request of Anda to the Consulado, Manila, 10 February 1774, sent with the letter of 1 January 1774, no. 367, AGI *Filipinas* 882.

³² Report of the Accountant, Tomás Ortiz de Landazuri, on the letters of Anda, dated 15 January 1773, no. 275, 20 June 1773, no. 303, and 7 July 1774, no. 377. This report was dated, Madrid, 30 April 1776, and followed by comments of the *fiscal* of His Majesty given on the same date, AGI *Filipinas* 882.

with a royal *cédula* of 4 December 1776³³ he studied the situation and learned that the exploitation of the Tanay mines had not been started. The bidder, Diego de Horcasitas, was an *alcalde mayor* in the Province of Panay and resided in its capital, Capiz. To his mind this situation was not disadvantageous since the conditions laid down by the bidder Horcasitas were such that it would have been more economical to import iron than obtaining it from him.

Since the royal *cédula* of 4 December 1776 forbade the direct administration of the mines by the government and since Horcasitas had not carried out his plans, it seemed that the only way to start the work at the mines was to accept the bid of a Chinese. But this was contrary to the provisions of the royal *cédula* passed in Aranjuez on 17 April 1766 which generally prohibited the granting of contracts to the Chinese. The *fiscal* of the *Audiencia* of Manila and the colonial official treasurer, José Antonio de Larzábal were of the opinion that the government should have direct administration of the mines. But the Governor considered this impossible since the royal treasury lacked the funds to finance such an undertaking. Basco submitted the case for reconsideration, asking if the proposal of the Chinese could be accepted in view of the fact that the *sangleys* were recently authorized again to reside in the Philippines. In effect, the *Contaduria* and the *fiscal* of the Council³⁴ were favorable to this solution. There was an indication in the report of the *Contaduria* that the prohibition in question "could be dissimulated".

The well-proven determination of Basco in developing the rich resources of the Archipelago led him to take an active interest in the matter as shown in his letter to Gálvez.³⁵ These efforts of the Governor brought about the request of four Spanish residents to exploit all the mines in the country ac-

³³ Basco to the King, Manila, 2 January 1779, no. 58, AGI *Filipinas* 882.

³⁴ Report of the *Contaduria*, Manila, 1 June 1780, and the official reply, 23 June 1780, AGI *Filipinas* 882.

³⁵ Basco to Gálvez, Manila, 5 June 1780, V.R., no. 278, AGI *Filipinas* 497.

ording to a contract with a set of 31 stipulations, dated 26 November 1779.³⁶

Among the more important conditions are the following: They asked that the duration of the contract be for ten years; that the mines to be exploited include not only those of Santa Inés, but also those of Mambulao, Calumpán, Hamosavan, Davao, Simbacan, Marulas, Angat, Mabitac and whatever other mines be discovered during this period. That the mines could be exploited in succession or simultaneously, without any other legal requirement than that previous notice be given to the authorities.

Under the terms of the agreement, the government may not enter into contract with any private individual nor undertake directly or in partnership the exploitation of any mine. This assured the contractors a monopoly of Philippine iron. They petitioned wider authorization to bring in from China or from other countries, master workmen and operators that were needed guaranteeing that these would live according to the laws of the country. They sought complete freedom in choosing sites for the ironworks without any other obligation than that they notify the Governor. It is understood that the sites chosen would be free and unclaimed lands.

In the ninth condition, they specified that only the contractors would be the exclusive and absolute intendants and directors of the enterprise and from among them would be nominated the *Administrador Superior* with the powers given to such officials stated in the *Ordenanza 77* of the new *Cuaderno de Minas* found in *Ley IX, título 13, libro VI de Castilla*. This provision confers such officials jurisdiction to punish minor offenses and in graver cases they may bring a complaint to the authorities directly without the intervention of *alcaldes*, *corregidores*, *gobernadores* and *jueces provinciales*. The local authorities are to render all the help they would need, after they had duly met payment of their respective taxes.

³⁶ "Condiciones con que D. Francisco David, D. Antonio Pacheco, don Vicente Díaz y don Pedro Angulo, vecinos y del comercio de Manila, se encargan del laboreo de las minas de hierro de las Islas Filipinas," accompanying the letter of Basco to Gálvez, *ibid*.

Once the contractors have stored up 6000 piculs of iron of a quality equal to or better than that imported from China, they would inform the government of this. From then on, imported iron, whether as crude iron or refined, should pay double tariff upon entering the country as a measure to protect the new industry. The contractors would then supply the iron needed at the following prices:

Platen	9 pesos per picul.
<i>Bergajon</i>	8 "
Iron blooms	7 "
Nails for ships	12 "
Nails for houses	17 "
Plows and plowshares	5-1/2 <i>unidad</i> .
<i>Carajayes</i> of the 1st class	20 pesos <i>unidad</i> .
<i>Carajayes</i> of the 2nd class	16 "
<i>Carajayes</i> of the 3rd class	5 "
<i>Carajayes</i> of the 4th class	4 "
<i>Cauas</i> of the 1st class for mills	72 "
Bullets of different calibres	11 pesos per m. <i>quintal</i>
Anchors of various sizes	14 pesos " "
Cannons of various calibres	14 pesos per <i>quintal</i>
A set of 3 medium sized <i>carajayes</i>	6 rials each

The contract stipulates that while it is in effect, the manufacture of such utensils and tools of iron will be restricted; this is tantamount to an exclusive privilege over the manufacture of such objects. On the other hand, the contractors promised to supply the government with these goods at a discount of 10 percent on the quoted prices. They made it clear that they were not obliged to supply a fixed quantity, but will deliver only what was available on hand. This term of the contract differs sharply from a previous offer of Salgado in connection with the exploitation of the Santa Ines mines, that he would deliver to the royal warehouses of Manila 2,000 piculs of iron yearly. But like Salgado, they also sought permission to make a shipment of 2,000 piculs of iron, or more if it would fit as ballast in the *nao* to Acapulco; and that the proceeds of its sale be returned to the Philippines free of duty. In the event that this is granted to them, they will oblige themselves to supply the Crown in the Islands iron at half the price marked for the market. Likewise, they agreed to give each

year in the form of a donation to His Majesty, whether in kind or its equivalent in money, 500 piculs of iron blooms, on the condition that they be made exempt from the *quintos*, *diezmos*, *veintena*, *treintena* land taxes or whatever exactions are enforced or to be enforced in the future. After the term of the contract has elapsed, they will present a sworn statement of their profits and losses. That if they agree to enter a new bidding, they will have an option to the lease, that is, if their offer is equal to that of the highest bidder. They also asked that should the opening of public roads become necessary for the exploitations, the Governor give in due time the orders to the adjacent towns to supply the manual labor, as was the usual practice. The daily provision and maintenance of the laborers to be charged to the account of the contractors.

Such are, in summary, the most exacting of the 31 clauses in the document. In the dispatch of the Governor to Spain regarding this contract, he indicated that in view of these onerous conditions, he decided to have the government undertake the exploitation of the mines.³⁷ Since to accept such terms, the price of iron will even be higher than if it were bought from abroad. Thus, he commissioned the official treasurer, Jose Antonio de Larzábal to choose a proper site for ironworks in the province of Laguna.

The chosen site was called San José de Oogong. Workshops were quickly put up, and furnaces mounted. At the same time iron ore extracted from the mineral deposits of Santa Inés, located about five or six leagues away was being transported to the ironworks on the back of carabaos.

The Government Assumes Mining at Santa Inés

The work at the mine of Santa Inés was at its peak one year after it was started.³⁸ Iron of various qualities had been extracted, bullets of varied calibers produced. The letter in which Basco narrates these achievements exudes optimism. But

³⁷ Basco to Gálvez, *ibid.*

³⁸ Basco to Gálvez, Manila, 12 May 1781, V.R., no. 385, AGI *Filipinas* 498.

in spite of this pleasing success, he never lost sight of the fact that this was all temporary until the work became secure and solvent enough to enable the government to relinquish its direct administration. José Antonio de Larzábal was appointed to direct the ironworks, a person, Basco writes, "whose knowledge of these I highly regard."³⁹ He was ordered to examine the places in the Province of Laguna de Bay indicated in his report of 30 September 1778, to choose the most advantageous site for setting up foundries following the Chinese method. The site was to be located near river banks to facilitate transportation.

Larzábal proved his enthusiasm and interest when two months after he was given his charge in May, 1780, he was able to do a first test. He cast 29 bullets of a fourth caliber using copper moulds which he secured from the *Real Fundición* in Manila. In July of 1780⁴⁰ he requested again for all types of moulds to cast bullets of different calibers, grenades, bombs, as well as ploughs and plowshares since the first test showed that these copper moulds resisted well the heat of the molten iron.

To refine the metal they tried first the method used by the engineer Miguel Antonio Gómez, but this failed. Their only recourse was to make use of the Chinese process, but which these would not divulge at any cost. However, with the shrewdness of the mine administrator, Don Joaquin de la Cuesta, and the technical resourcefulness of the natives, they soon discovered the Chinese method and with it succeeded in smelting and refining iron competently. The results at this point were superior to all that had been obtained before including those from the Santa Inés mine during the exploitation of Don Juan de Asso y Otal, Don Juan Francisco Solano, and Don Francisco Casañas before the 1762 British invasion.

Larzábal, who was a strong advocate of having the mines directly controlled by the government, says that if this had

³⁹ Decree of Basco, 3 March 1780, included in the introduction of the testimony accompanying the letter of the colonial official treasurer, José Antonio de Larzábal to the King, Manila, 20 May 1781, no. 19, *AGI Filipinas* 882.

⁴⁰ Larzábal to Basco, Manila, 14 July 1780, *ibid.*

been done earlier the natives would have easily engaged in this industry. This was possible because the foundries produced the small "Chinese-style kilns" which were portable and inexpensive and would have been widely used. Thus, they would have had a production enough to supply the country as well as a surplus for export.⁴¹

Soon they had a number of native masters and skilled workmen which freed them from the indispensable Chinese.⁴² They built a special furnace to re-cast ploughs, *carajais*, and bullets which increased their production, since as Cuesta reports, "from each casting mould it was possible to get one quintal of molten iron enough for 7 pairs of ploughs which was not obtained in the first casting because of too much slag."⁴³

The results obtained during the months that the government took control of the mine operations were as follows.⁴⁴

	Quantity	Price
Refined iron blooms	328 m. quintals	
	3 <i>arrobas</i> 11 lbs. ==	717p. 4r. 1g.
Sheet iron	5 m. quintals	
	3 <i>arrobas</i> 3 lbs. ==	21p. 3r. 9g.
Iron made into nails	2 m. quintals	
of 4 and 5 pts.	3 <i>arrobas</i> 8 lbs. =	28p. 2r. 4g.
Cast iron in the form		
of ploughs (314) and	27 m. quintals	
plowshares (222)	4 <i>arrobas</i> 6 lbs. ==	161p. 0r. 0g.
		<hr/> 929p. 2r. 2g.

However, they had to contend with the cupidity of the natives who mixed the iron ore from Santa Inés with that from the mountain of San Andrés which was of inferior quality. As a result in some foundries the reduction of iron when processed was 35 to 40 percent. These fraudulent practices were more

⁴¹ Larzábal to the King, *ibid.*

⁴² Joaquín de la Cuesta to Larzábal, San José de Oogong, 9 July 1780, *ibid.*

⁴³ Cuesta to Larzábal, San José de Oogong, 13 October 1780, *ibid.*

⁴⁴ "De todo el fierro afinado y labrado que se ha introducido en los reales almacenes de esta Plaza procedente de las oficinas de ferre-rías." Testimony no. 5, accompanying the letter of Larzábal to the King, Manila. 20 May 1781, AGI *Filipinas* 499.

prevalent when the mineral was extracted and transported under the supervision of the government.

The New Lease of Mines and Ironworks.

While all that was taking place, the Governor was considering the proposal of Doña Maria Isabel Careaga, hoping to free the government of the direct operation of the mine as prescribed by the Crown. The proposal of Careaga (already a contractor in the wine industry) contained a set of 22 conditions which Basco found unacceptable as were those of Don Francisco David and his associates. In view of this, the solicitor withdrew her proposal. Instead, she offered to work the mine in the capacity of a claimant subject to the regulations which pertain to this type of exploitation. She made it a condition that she be not deprived of the mine unless the government decide again to undertake the work. Should this be acceptable, she promised to pay for all the equipment and iron tools already in the mine and foundries and to cover the cost incurred by the government during its operation of the mine.

After careful study and consultation, Basco, who favored the idea, awarded Careaga the lease of the mine by the decree of 10 January 1781.⁴⁵ This ushered in a new stage in the exploitation of the Santa Inés mine whose transfer to Doña Maria Isabel Carcaga was notarized publicly and approved by a royal order communicated to Basco on 19 March 1783.⁴⁶ In the same year, the leaseholder of the mine, through her representative in Madrid, Don José de la Dehesa, petitioned the Crown for permission to ship 2,000 piculs of iron to Acapulco annually under the same terms that we have seen repeatedly. She also asked exemption for all the workers of the mine and foundry, the natives, mestizos, and other nationals, from the *polos* and personal services; that those who had given service in the mines for approximately three years, remain exempted for life. Another petition was for authorization to bring in

⁴⁵ Included in the testimony accompanying the letter of Basco to Gálvez, Manila, 12 May 1781, V.R., AGI *Filipinas* 690.

⁴⁶ Basco acknowledges receipt of this royal order in a letter to Gálvez, Manila, 31 December 1783, no. 665, AGI *Filipinas* 690.

from China needed masters and skilled workmen although they be pagans, that they would not be affected by any order of expulsion that might be passed in the future. Finally, that once the production of the mine met the needs of the country, the importation of iron be prohibited, or at least have imposed on it a double duty upon entry.⁴⁷

It is curious that these petitions are exactly the same ones contained in a contract that was rejected in the Philippines, but now in Madrid were all granted by the royal *cédula* of 26 December 1783,⁴⁸ with the exception of one, that of imposing the double duty on imported iron.

The Mount Angat Mine

At the same time that Careaga took over the operation of the Santa Inés mine, another resident of Manila, Don Lorenzo Buicoechea, asked for the license to work the mines in the hills of Angat in the Province of Bulacan.⁴⁹ These were also discovered by Salgado, who claimed that they were richer than the Santa Inés mine. They were favorably situated, being only about 10 leagues from Manila, and the region had an abundance of timber for charcoal, was populated and well-supplied with provisions and livestock. There was also a river strong enough to move the needed hydraulic machines.⁵⁰

By the end of 1783 the exploitation of Buicoechea was in progress. At this time Basco sent samples of a high-grade iron and steel to Spain and reported that the ironworks was being directed by the chaplain of the Armada, Don Juan Belli whom he had authorized to remain in the Philippines as a

⁴⁷ Petition of José de la Dehesa, Madrid, 20 April 1783, AGI *Filipinas* 882.

⁴⁸ Royal *cédula* addressed to Dr. Isabel Careaga, Madrid, 26 December 1783, AGI *Filipinas* 881.

⁴⁹ Basco to Gálvez, Manila, 30 May 1781, AGI *Filipinas* 688.

⁵⁰ Report of Salgado, 9 April 1760, appears in folio 11 of the testimony accompanying the letter of Bishop Espeleta to Arriaga, Manila, 17 July 1760, AGI *Filipinas* 680.

technical supervisor in the mines.⁵¹ In Basco's evaluation, putting together the production of this mine and that of Santa Inés would still not be sufficient to meet the demand in the country. Moreover, the accounts showed that the yield of both mines fell below their production capacity. Careaga was then quite old, and needed an active administrator to direct the exploitation. Buicoechea, on the other hand, did not have the necessary capital to maintain the ironworks on maximum output.

In view of this, Basco remarks, "there is a need for energetic persons with sufficient capital," or a company that is able to install the drop hammers and other necessary equipment. Without this they could only manufacture ploughs and other iron tools for domestic use, and must continue importing the metal used for the manufacture of anchors, cannons, bombs, bullets, and other materials used for building ships.⁵²

COPPER DEPOSITS

This metal was always less abundant in the Philippines than iron. During the period under study, we find only one attempt at mining operations, that of Francisco Xavier Salgado. He had reports that copper mineral was found on the island of Masbate, and he sent one experienced miner, Pedro Angel Sáenz, to survey it. Of the 19 bags of copper ore that he brought upon his return to Manila, 11 metal plates weighing half an *arroba* each were obtained. Salgado, as was his usual practice, sent a sample to the King, and with it a sample of the mineral itself. At the same time he sent various pieces to Mexico, China, and the Coast of Coromandel that they might be examined by experts on the substance since the color of the mineral "which seemed like the fine *tumbaga*" (the gold-copper alloy) made him suspect that it contained gold. But the results of the analysis were negative: from Mexico they said that the precious metal was not found in it, although the copper was of first quality; from China the reply was that the copper was of the same quality as that found in Japan with which they were more familiar; from the Coast,

⁵¹ Basco to Gálvez, Manila, 31 December 1783, AGI *Filipinas* 690.

⁵² *Ibid.*

of Coromandel although the analysis was not done due to the lack of experts, they were of the opinion that simply from its appearance the metal seemed quite fine.⁵³

Meanwhile, Salgado had communicated his findings to the Governor, Simon de Anda, requesting assistance to develop the copper mine,⁵⁴ located on the island of Masbate, about 60 or 70 leagues from Manila. The neighboring islands are those of Burias, Ticao, Sámar, Leyte, Cebú, Negros, and Panay, and a number of small ones. It is surrounded by "eleven provinces, the most distant can be reached by sea on a regular monsoon in less than a day and night, and most of the others within a few hours."⁵⁵ The island had a wealth of other resources. It had vein deposits of gold 20 carat fine; its mountains were rich in wax and tar, the forests teemed with pigs, deers and civet cats; from its shores were gathered amber and sea cucumber. In the surrounding waters there were pearl-oyster banks but which the natives could not cultivate because of the incessant attacks of Moro pirates. A small fleet stationed there to guard the coasts would be sufficient, and the riches of the island could be made profitable. In time a lucrative trade could grow supplying the inhabitants and those of the neighboring islands with commodities and articles for consumption, at the same time enable them to sell their products.⁵⁶

It is therefore not surprising that Salgado presented himself to the Governor and took the initiative of exploiting the island. He asked for the charge under the following conditions: That ships be delivered to him on loan, which he would pay for in case of loss or damage; that these ships be allowed to fly the flag carrying the royal emblem, and the crew be permitted to wear the uniform of the navy, which

⁵³ Salgado to Basco, San Jacinto, 2 September 1781, accompanying the letter of Basco to Gálvez, Manila, 15 May 1782, AGI *Filipinas* 723.

⁵⁴ Anda remitted a copy of these conditions proposed by Salgado in a letter dated 7 July 1775. The report of the *Contaduría* in Madrid, dated 5 October 1776, favored the approval of these conditions. AGI *Filipinas* 881.

⁵⁵ Report of Salgado, 2 September 1781, AGI *Filipinas* 723.

⁵⁶ *Ibid.*

livery will be placed in his accounts. That he be authorized to erect two forts in Masbate, using his own men in the construction. That he be appointed captain of the fort and chief magistrate. By these last two conditions he sought to guarantee the protection of the island from marauding Moro pirates. He asked further that the island of Masbate be removed from the jurisdiction of the Province of Albay, and that he be authorized to collect the tributes which he promised to deposit in the royal treasury. The *alcalde mayor* of the new province would be empowered to nominate the *gobernadorcillo* and other officials of the town of Mobo, the only town of the island then, and whatever towns would be founded.

With respect to the operation of the copper mine, Salgado requested that he be authorized to bring in from China 12 founders and one collier. The Governor granted this seeing its necessity. Salgado also asked permission to send the extracted copper mineral to New Spain as ballast for the *nao*, in order to process and separate its gold content since this could not be done in the Philippines. Apparently, when he thought of this petition he was not aware yet of the negative results of the analysis on the samples he sent earlier. Thus not knowing this, he offered to pay duties for the gold metal in the royal treasury of Mexico; and requested that the amount to which he was entitled be sold there, the proceeds to be returned to the Archipelago in silver pesos, duly registered and entered without new charges; the unsold mineral to be returned likewise as ballast. Anda reserved decision on this clause, but he did indicate that the duties paid in the royal treasury of Mexico for the gold extracted be entered instead into the royal treasury of the Philippines, the gold being a product of the Archipelago. Lastly, Salgado agreed to supply the government the copper that it will need with a discount of 4 rials each quintal on the current price, on condition that the payment is made in Manila, or in one of the neighboring provinces, and always in cash.

Anda did not provide the ships requested by Salgado, but did give him pieces of ordnance, arms and munitions; he authorized the erection of two forts but reserved the right to

appoint the captains of the forts. He permitted the separation of Masbate from the jurisdiction of Albay, but did not allow the *alcalde mayor* to appoint local authorities, preferring that they follow the same procedure of appointment as in the other towns of the Province of Albay.

All these measures of Anda were approved by the royal *cédula* of 13 March 1777,⁵⁷ which ordered that Salgado be given as much help as he needed to dislodge the Moros from Masbate. It was provided further that if the proceeds from the gold extracted in Mexico be returned to the Philippines in silver pesos, he would not be made to pay new charges, but if converted into commodities for trade he would have to pay the corresponding duties.

Salgado equipped a small fleet of five ships to transport men and supplies, well-armed for defense against the Moros. But the procrastinations of the *oficiales reales* prevented the expedition from taking place under favorable circumstances. Thus, with the total failure of this project, no further efforts were attempted for some time to exploit the copper mine of Masbate.

GOLD

The existence of gold veins in the Province of Camarines was known at least by the early 17th century, since there already was a decree in 1635 with a provision that Filipino miners should enjoy all those privileges set down by the *Leyes y Ordenanzas*, that the Governors take particular care to protect the rights of the miners, and that the operation of mines be efficiently done.⁵⁹ But the fact is that the Spaniards hardly gave themselves to the mining of gold until the second half of the 18th century.

In 1754, Don Francisco Xavier Estorgo Gallegos, a ship pilot, informed the Governor of his plans to go to Paracali

⁵⁷ El Pardo, 13 March 1777, AGI *Filipinas* 881.

⁵⁸ Report of the *fiscal* of His Majesty regarding the papers sent by Arandía with a letter to the King, Manila, 14 July 1755, no. 9. The official reply was dated Madrid, 11 January 1757, AGI *Filipinas* 155.

where there was an abundance of gold according to his sources. He therefore petitioned that the *alcalde mayor* and the *gobernadorcillos* of that province be given authority to hand over to him immediately the mines that he will claim, and so begin his exploitation without any delay.⁵⁹ Given this authorization by a decree of Arandía on the 14th of August of the same year⁶⁰, Estorgo left for Paracali where, during the first days of September, he laid claim to five gold mines. The first was situated in the mountain of Lipata, whose vein ran from north to south. North of this site which Estorgo named San Nicolás de Tolentino, was a mine pit worked by the mestizo Juan de la Serna. Estorgo asked that the landmarks between the two claims be defined and this was determined on September 3, the same day Estorgo took possession of the mine. The approach to an abandoned mine, previously exploited by a resident there called José Patiño, marked the limits of the two claims.

On that day, Estorgo took possession of another mine situated in the same mountain, which he called *Socavón de las Animas*. This was located about fifty fathoms from a mine worked by Juan de Aguirre, a resident of Paracali, and was in the valley of the Malaguit river. The third gold mine claimed by Estorgo Gallegos was in the mountain of Davajan, and this he occupied on the 5th of September, giving it the name of *Nuestra Señora de la Soledad de la Puerta Boga*.⁶¹ On the same day, he acquired a gold vein located in the small hill of San Antonio belonging to the Cacatugan mountain, about 2 or 3 leagues from Paracali. This he registered under the name of *San Francisco*. Finally, four days later, he laid claim to his fifth mine in the Minalapayongan mountain, near Mambulao, to which he gave the name of *Nuestra Señora de los Dolores*.⁶²

⁵⁹ Manuscript of Estorgo, undated, to Arandía fol. 1v-3, *ibid*.

⁶⁰ Folios 3 and 4, *ibid*.

⁶¹ In honor of the Image venerated in the hermitage near the gate of the city of Cavite. "Boga" in tagalog means *new*.

⁶² The claims to these mines are included in the testimony, folio 4v-17v, AGI *Filipinas* 723.

Estorgo confirmed his claims to the five mines before the Governor, and on the favorable report of the *fiscal*, was granted authorization to operate them. He was advised that in accordance with the specifications of the *Ordenanzas de minas*, he was to open in each of the mines a shaft six yards in depth and 3 yards lengthwise; to set the boundaries of the mines; and that he was obliged to pay the royal fifth for the gold extracted.

He also asked and secured permission to raise a fort of stone and mortar to defend the coast of Paracali against Moro invasions, assuming the cost of construction and the maintenance of the garrison. He asked to be appointed captain of the fort, and Dionisio Muñoz to be named his deputy.⁶³ Having been granted all this by the Governor, he erected the fort called San Fernando de Malaguit.

In February of 1755,⁶⁴ he asked for authorization to fortify a hill near Mambulao overlooking a site appropriate for "a crushing plant and mills for the processing of metals... and it is by a river whose strong currents facilitate transporting these metals," and it is easy to defend. This was the same site where Salgado, as we saw, set up his ironworks but which was abandoned shortly after Arandía became Governor. The fort was constructed, called Fort of San Carlos, and Arandía appointed Estorgo captain of the fort. This was ratified by a royal *cédula* of 11 May 1757, which decree also gave him the same position at the Fort of San Fernando de Malaguit. Another decree of the same date approved all the measures taken by Arandía in this matter.⁶⁵

We owe to the same Estorgo Gallegos a complete description of the gold mines of Paracali which he wrote in a report answering a questionnaire sent to all the territories of the

⁶³ Folios 24v-25v, *ibid.*

⁶⁴ Estorgo to the Governor, Mambulao, 15 February 1755, fol. 26-30, *ibid.* The decree giving the authorization is dated Manila, 7 April 1755, fol. 30v-32, *ibid.*

⁶⁵ Both were given in Aranjuez, 11 May 1757, AGI *Filipinas* 480.

Indies by circular order in 1757.⁶⁶ The center of the gold belt was located, Estorgo believed, in the mountain of Labo. The natives believed that this mountain was bewitched and refused to serve Estorgo as guides to climb its peak. From this mountain, the gold veins dipped to the plain. But the gold was difficult to mine in the plain since its nearness to the sea, water being found at a shallow depth, posed the problem of keeping the diggings dry. The veins strike north and south and dip either northwest or northeast. These fissure veins were the richest ones although there were also good ones extending from east to west, called transversals. At the places where these veins intersect was found gold of fine quality.

Gold veins were also found on moderate slopes and from one of these Estorgo obtained the best yields. In this one he reached a depth of 32 *estados*⁶⁷ at which level he struck water which was impossible to drain out because it was too near a swelling river. The sample of the metal that Estorgo sent to the King in 1756 was extracted from these mines.

In many cases, veins found along the coasts could be mined after diverting the course of the smaller streams. It was rare to find a mine that could be worked without first solving the drainage problem since all the mines were flooded 8 to 12 fathoms deep, and sometimes 6 or 7 fathoms which made it necessary to drain them continually with hoisting machines.⁶⁸ On the other hand, the presence of these streams where the terrain is rugged helped the exploitation of the metal, particularly of two whose currents were strong enough to turn water mills. At the same time, the forests assured a supply of timber used for the construction of mine galleries.

Some gold veins occurred in large, live rock. Crushing the hard rock was difficult, and the short endurance of the natives

⁶⁶ Arriaga sent this questionnaire to Arandía with a letter, Madrid, 1 November 1757, fol. 2-2v, accompanying the letter of Bishop Ezpeleta to Arriaga, Manila, 17 July 1760, no. 16, AGI *Filipinas* 680.

⁶⁷ The "estado" is a measure taken from the average height of a man. It is used to measure heights and depths, and is equivalent to approximately one meter and seventy-five centimeters.

⁶⁸ Horse-drawn machine similar to a winch, constructed with a drum and levers.

made it almost impossible to mine the ore. Quartz veins not only formed a system around, but also penetrated into the smooth main vein. The ore in some veins was in the form of a very hard, white or bluish stone called *guija*,⁶⁹ and in others it was covered with a slate-like gangue, smooth and glossy resembling soap or pewter. The natives called this gangue "*lilón*." Most of it was found on chalky or sandy terrain from where the better quality metal is obtained. Some of these veins measured approximately half a yard, and others from one to three fingers in breadth, called "*cintillas*" which although small were often valuable. Moreover, from the surrounding sandy land a metal of good quality was also recovered, yielding six ounces of gold each quintal.⁷⁰

The difficulties and obstacles depicted in this report persisted till the end of the century. It is interesting to compare what Estorgo said then with this paragraph written during the first years of the 19th century by a French traveller, Félix Renouard de Sainté-Croix:

In all the places where mineral deposits are found, the water is found at a shallow depth. There the work discontinues, lacking the machineries to work with. If the mine proves impervious to their instruments, they gave up right there and then because they did not know how to crush the hard stones by using gunpowder.

The Indios limit themselves therefore to extracting from the mines small quantities of mineral which they collect either from the soil or from stones which they give to the women who wash and reduce them to powder; afterwards they place them in shells which they cast in a fire, fanning the fire with a banana leaf, and stirring the fire with a cane-stalk.⁷¹

The author of these lines was well versed in mining and was precisely commissioned in June 1805 to inspect the gold mines

⁶⁹ Hard and small pebble-stones found on river banks, river beds and streams.

⁷⁰ Report of Estorgo, Real Fuerza de San Fernando de Malaguit, undated, fol. 12-16v., AGI *Filipinas* 680.

⁷¹ Felix Renouard de Sainté-Croix, "Voyage commercial et politique aux Indes Orientales, aux îles Philippines à la Chine, avec des notions sur la Cochinchine et le Tonquin, pendant les années 1803-1807," (Paris, 1810). Cited in Montero y Vidal, *Historia General de Filipinas* (3 v., Madrid, 1882-1890) II, p. 364.

of this region which were more neglected than during the period we are studying. The report of Saint-Croix confirms that of Estorgo concerning the richness of the veins and the difficulties of their exploitation.

Upon Estorgo's death, the work was again left to the hands of the natives who were satisfied with placer mining which yielded little gold. But during the governorship of Basco, renewed interest in the extraction of gold took place. For this purpose the Governor made Don Juan Belli, chaplain of the frigate *Venus*, a man knowledgeable and experienced in metallurgy, to stay in the Philippines, retaining his naval rank and salary. The Governor intended him to instruct the natives "in the method of extracting and purifying gold and other metals." Basco considered it worthwhile to renew the operation of the Paracali mines, which had been abandoned for many years, although the *Recopilación de Leyes de Indias* make special reference to them in the *Ley VI, título XX del libro IV*.⁷²

Belli did not fail the expectations placed in him, since by the time he returned to Manila due to illness he already had the operation of one mine going: a gallery several yards in length was under construction;⁷³ instructions were given on how to purify the air of the mine pits, whose density had caused many deaths among the natives through asphyxiation.

It seems that Belli stayed in Paracali for almost two years (1778-1781) since he was back in Manila in May 1781.⁷⁴ The importance of the mines discovered in Camarines as well as in other parts of the Archipelago, moved Basco to propose the erection in Manila of a *Casa de Moneda*. This would have control of the metal extracted from the mines and the activities of the placer miners who up to that time had never contributed anything to the royal treasury. It would also prohibit, under severe penalties, the export of gold bullion and set up a standard for the quality of gold ornaments. In his judg-

⁷² Basco to Gálvez, Manila, 17 December 1778, no. 20, AGI *Filipinas* 658.

⁷³ Basco to Gálvez, Manila, 10 May 1781, no. 38, AGI *Filipinas* 499.

⁷⁴ *Ibid.*

ment, this *Casa de Moneda* should be likened "to a gentleman of limited means, who tied to the obligations of his family, aims only at perpetuating his interests."⁷⁵ In case his plan should be approved he had taken the necessary steps of bringing in from New Spain workers, machinery, handbooks of instructions and directions and a professional assayer.

But the Court considered Basco's data insufficient as the basis of a decision.⁷⁶ He was asked to relay further information concerning the mines existing in the Archipelago and to include the cost of constructing and maintaining the contemplated *Casa de Moneda*.⁷⁷

By then it was Don Félix Berenguer de Marquina's responsibility to carry out the order and while he apprised himself of the details of the matter, he wrote advanced notices on the facts he had gathered on the subject. One deduces from his letter that the recovery of gold continued to be done in a primitive way, that is, through placer mining, since the excessive cost of shaft mining was beyond reach of the limited capital of the Spaniards then residing in the Philippines. The Governor added that "he had not come across a single instance of the use of advanced methods for the recovery of gold, and that this is one of the principal reasons why they have not been able to produce sufficient quantities of metal."⁷⁸ We know that this situation persisted till the end of the 18th century and well into the early part of the next.

But in spite of the primitive methods used, the amount of gold recovered was not insignificant although it is not possible to cite exact figures since its miners were not subject to any control and did not have to pay tributes. But if one is to believe the figures given in 1765 by the *fiscal* Viana, who estimated the value of the gold yearly recovered at 500,000 pesos,

⁷⁵ *Ibid.*

⁷⁶ Report of the *Contaduria*, Madrid, 17 March 1783, AGI *Filipinas* 881.

⁷⁷ Royal *cédula*, El Pardo, 14 March 1785, accompanying the letter of Marquina to the King, Manila, 1 March 1788, AGI *Filipinas* 658.

⁷⁸ Marquina to the King, *ibid.*

and taking into account that gold of 22 carats fine was then sold at 16 pesos a *tael*, then the amount of gold annually recovered would come to some 31,250 *taeles*.⁷⁹

OTHER MINERALS

To complete this brief survey of Philippine minerals, we ought to mention the other products which although produced in lesser scale, nevertheless form part and parcel of the economic history of the country.

Basco, ever alert to promote what could be significant sources of wealth for the Archipelago, received notices of the existence on the island of Biliran of "two mines of quicksilver, others of gold and of silver, two of sulphur. . . and on Maripipi, in addition to fruits, tar is dried."⁸⁰ He immediately sent a galley under the command of Don Francisco Pérez to reconnoiter the islands which are among the smallest in the Archipelago and are near Cebú. Although the findings of this expedition proved to be negative, the Governor refused to give up the project.

In 1771, with Anda as Governor, the exploitation of tar was begun in the Province of Zambales, whose yield was so abundant that it sufficed not only to supply the Cavite shipyard, but was also marketed outside to the people. The product was of the best quality and priced much lower than that imported from Batavia, China and the Coast of Coromandel which was then in much demand. The Governor hoped that the expansion of the tar factory would lead to the exportation of this product, but this expectation never materialized.⁸¹

⁷⁹ The *tael*, more than an imaginary money and a common unit of accounts was used in the Philippines as a weight of precious metals and is equivalent to 37 grams and 69 centigrams.

⁸⁰ Basco to Gálvez, Manila, 12 May 1781, V.R. no. 394, AGI *Filipinas* 498.

⁸¹ Anda to Arriaga, Manila, 17 January 1773, no. 283, AGI *Filipinas* 493; *ARAF*, no. 3, p. 272.

