

miners themselves, reposed so much confidence in my technical opinion and judgment, as to come forward, under such discouraging circumstances, and, in May 1849, boldly take up the enterprise, on terms which, although not returning to the English adventurers much of their lost capital, at least relieved them from all farther responsibility.

“In a few words, I will now explain the grounds on which I was induced to take the responsible measure of inducing the present parties to enter on this extensive undertaking, and the manner in which, by the investment of further capital, I proposed to obtain for them a better result in future.

“After giving all due credit to my predecessors for the skill and energy with which their mining operations had been conceived and carried out—and fully admitting, that it is far easier to criticise results than to plan measures—it appeared to me, that the concern had hitherto been worked, as well on too limited a scale, as with too expensive an establishment; but particularly, that, without any effective attempt to render the poorer and more abundant ores available,

or to make new discoveries on the higher and still virgin portions of the veins, every effort had been directed to the search after rich ores in depth, which, when at last discovered, did not remunerate the large amount invested to find them. Experience had convinced me, that, to render an extensive mining enterprise like this secure, it should mainly depend on the poor and abundant ore of its veins for the current cost of exploring them; so that the richer bunches, which would occur in a regular and systematic process of working, might be found without any forced effort or outlay, and thus become more profitable. It was further clear, that, as certain costs, such as general management, drainage, rents to owners, etc., etc., were unavoidable, and nearly the same under any scale of operations, that a larger return of the poorer ores must be obtained, in order to support them; and, lastly, that a perfect system of economy, in every branch of so large an establishment, was most essential to its success.

“To carry out these views, I commenced by arranging the entire system of accounts on such a plan, that every week's result, in each mine

and reduction-work, might be clearly shown, and the economy of the different departments thus fairly compared against each other. To reduce the excessive cost of drainage, I abandoned (to some future and more favourable moment) the very deep workings on the Biscayna vein, and only maintained the water to 130 yards under adit, by one large steam-engine at Dolores; while, at the same time, the extraction of poor ores (which existed above this level in great quantities in the north and south veins of the Santa Brigida and Santa Iñez) was facilitated and increased by additional shafts, winding-machines, internal rail-roads, yards for picking and storing the ore, etc., etc.

“Conjointly with these operations, I selected the eastern and yet virgin portion of the Biscayna vein for the site of new trials, in high ground, above water-level. In making this choice, I was guided by the well-ascertained fact, that the former rich formation of ore, which had been worked to so much profit, from the Santa Teresa and Terreros shafts, was caused by the coming together of the Biscayna and another parallel vein, called the Tapona; and by my having ascertained,

by careful surveys, that another similar junction might be expected to the east of the old and once-celebrated mines of La Palma and San Ramon, then the furthestmost workings in that direction. To solve this interesting mine-problem, I continued driving the great *adit* in that direction; a work which, as far as I can ascertain, had been discontinued since the time of the first Conde de Regla; and after passing through, as was calculated, a long portion of dead or unproductive vein, my expectations have been at last realised by the discovery of a new, and, as far as we can yet judge, very promising formation of ore. At present, being four hundred yards to the east of the nearest shaft, the ventilation is so bad, that, even with the aid of air-machines, we can with difficulty continue to work on a very limited scale; but, by the end of this year, we hope to communicate the *adit* with the new shaft of San Patricio, which, simultaneously with the under-trial, I commenced in that direction; and then there is little doubt of our having a perfectly new and good mine, with the very great recommendation of its being also a dry one.

"But the most arduous and costly part of my plan for returning a large quantity of poor ores, arose from the necessary extension of reduction-power, which the company then possessed on a very limited scale in the *haciendas* of Regla and Sanchez.

"I must here explain a peculiarity in the formation of the mineral veins of this district; that, while those which run in an easterly and westerly direction produce ores that are readily reduced by the usual amalgamation process, which is practised to so great an extent in this country; the ores from the north and south veins have quite a different mineral character, and, in many cases, cannot be made to yield their silver by this process. Trials at the *hacienda* of Sanchez having, however, proved that they could be advantageously reduced by a modification of the well-known system of barrels, as practised at Freiberg, in Saxony; and the great mass of poor ores on which we could count being of this character, I determined to adopt the barrel-amalgamation on a very large scale.

"For this purpose, my chief attention during the last two and a half years has been directed to

the erection of the two entirely new works at San Miguel and Velasco, as well as to enlarging and reforming those of Regla and Sanchez; a heavy and costly undertaking, which I am most happy to say is at last concluded, and these four large reduction-works are now in full operation. That of Regla, in addition to smelting all the richer ores that we are likely to obtain, can also amalgamate, by the *patio* or common country process, 800 *cargas* of ore per week, and which I count on soon supplying from the new eastern discoveries on the Biscayna vein; while the three other *haciendas* of San Miguel, Velasco, and Sanchez, can amalgamate, in barrels, 2700 *cargas* more of the abundant refractory ores, from the north and south veins.

"In the *haciendas* of San Miguel and Regla, which have been placed at a distance of twelve miles from the mines, in order to take advantage of a powerful stream which rises out of the ground in their immediate neighbourhood, water power is alone used to drive the extensive machinery, which is employed to blow the furnaces, grind the ores, or revolve the barrels; but at the *haciendas* of Sanchez and Velasco, which are built at the mouth of the valley descending from the mines,

and only depend on the limited quantity of water extracted by the engine from the veins, steam is also employed as an auxiliary power. So that besides the powerful pumping engine of 75 inch cylinder which drains the mines, we have now in motion at the reduction-works, two smaller rotatory steam engines, and eighteen water-wheels of different sizes, which drive 110 wet stampers or pounding mills; sixteen large "*arrastres*" and three edge-stone mills, all employed in grinding ores; besides revolving sixty-four large barrels, in which the prepared ores are afterwards amalgamated. In the *hacienda* of Regla, there are ten blast furnaces used for the smelting of rich ore when we can obtain it; and in San Miguel, Velasco, and Sanchez, thirty-six reverberatory furnaces, for drying and chlororising the ores preparatory to amalgamation in the barrels. Two of these furnaces at Velasco are revolving ones, which both feed, and rake the ore and salt, by machinery.

"Over and above the discovery of ore already alluded to, in the eastern ground of the Biscayna vein, we have also at Pachuca, a mine called Rosario, in very good produce; and in which, in

an adit driven to the junction of the Rosario vein, with the famous one of Xacal, a large body of good ore has been met with.

"My calculations, on commencing operations for the new adventurers, were as follows:—that returning 3000 *cargas* per week, of the poor but abundant ores of the north and south veins, from which an average produce of 4 to 4½ marks of silver per ton might be expected, would pay all cost, and a moderate interest on the new outlay that was necessary; leaving the probable chance of discovering richer ores, for increasing the profit.

"During the last two and a half years, and while augmenting our reduction-works, we have, besides those returned, and producing 1,683,713 dollars' worth of silver, also accumulated 90,000 *cargas* of these poor ores, and we are now extracting 3000 *cargas* per week; but owing to the superior class of those from Rosario mine, the average yield has increased to nearly six marks per ton, and our produce of silver to twenty bars, worth 20,000 dollars per week; which is likely to increase as soon as the new discovery on eastern Biscayna is ventilated and fairly worked.

"With this produce, I can confidently count on leaving a steady annual profit, of at least 200,000 dollars; which you will allow is no bad result for mines, which only three years ago were on the very verge of ultimate abandonment; while should our discoveries on the eastern ground of the Biscayna, or elsewhere, lead to the produce of any quantities of the rich ores, which this vein has yielded in other parts; our profits will of course be greatly increased.

"I have, as yet, omitted to mention, what in my opinion, is a work of the greatest interest, as one which would secure the continued prosperity of the mines of this district for many years to come. It will be remembered, that the first Conde de Regla distinguished himself, and made the fortune of his family, by driving the present adit or horizontal tunnel, which drained the mines of the Biscayna to the depth of two hundred yards from the surface, but that having exhausted all the known riches of the veins above that level, the second Conde had continued their excavations to a hundred and eight yards below it; being the limit to which they could be worked with profit by horse-power drainage.

"The English Company, by the powerful aid of steam, afterwards carried down these workings to more than double that depth, or 240 yards under adit; but here we find another limit to profitable working, as the deeper excavations on the Biscayna vein are again abandoned to fill with water. To Don Jose Castelazo, the mine-agent of the late, or third Conde de Regla, is due the credit of having planned and begun to work, in 1816, a second or deeper adit; which, commencing at the mouth of the valley, and near the small town of Omutlan, would enter and drain the mines, to 130 yards below the level of the present, or Conde's adit.

"It is true, that the great distance which this gallery had to be driven, of 4,500 yards from its mouth to Dolores' shaft, and that mostly through very hard rock, rendered it an undertaking of considerable time and cost to accomplish. Yet had it been actively and constantly persevered in by the English Company, and with the investment of but little more capital than that expended in applying larger steam engines, it would have long since reached the mines, and no doubt given a very different turn to the fortunes of that Company.

"When the working of the mines was resumed in 1825, their deepest pits were only 108 yards under the old adit; so that this *new* one would have laid the mines completely dry, and even have enabled them to be sunk below that level, on the same footing as the second Conde had worked below the first adit, with all the additional advantage of steam over horse power. But unfortunately the more speedy plan (as it was supposed) of carrying down the mine by dint of powerful steam engines, was adopted, in preference to the slower but surer one, of first driving home the deep adit; the progress of which, during the last twenty-five years, has been so slow, that about 3,000 yards are still wanting to reach the Biscayna.

"My present plan, for securing, in the first instance, the stability of the Company, has been to return with economy, and on an extended scale, the poor ores that are rendered accessible by the steam engine already erected and at work, making at the same time discoveries on the high and virgin extremes of the vein; but I also consider it of the greatest importance not to neglect the great work of the deep adit, which, besides laying the whole district dry to the depth of 300 yards,

with the great probability of making important discoveries on the many mineral veins to be intersected in its course, will also form quite a new era in the working of the deep mines of the Biscayna, by reducing their drainage-depth from 240 to 110 yards; and consequently rendering again highly profitable the workings which were abandoned in good ores at the bottoms of both Terreros and Dolores.

"At present we are only driving this deep adit (called the "Socabon Aviadora") from two points, and barely progressing at the rate of three yards per week; but as soon as other arrangements permit, we propose to push on this important work from two other intermediate points, by which means it would be completed in five years; and thus enhance, to a very great extent, the value of the mining property belonging to the new Real del Monte Company.

"Yours, my dear Sir, very truly,

"JOHN H. BUCHAN."