The Ancient Mining of Gold, Silver, and Precious Stones

BY

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"PARASITES OF INSECTS;" "THE TRUE ANALYSIS OF MILK;"
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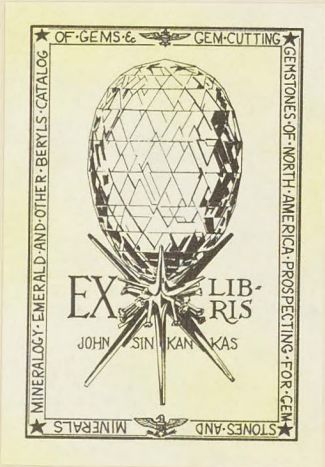

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AFFECTIONATELY DEDICATED TO

MY DEAR FATHER.

CONTENTS.

CHAPTER I.

THE EARLIEST OF THE MINES

THE art or science of mining is one of the most ancient industries known. So remote in the past was its beginning, that the oldest of the old historians, both sacred and profane, whether in actual writing or hieroglyphical record, evidently considered it too common a subject to need more than a passing mention. So that while we find records and evidences of minerals on old monuments and utensils unearthed from time to time, with regard to the methods practised in mining we can only conjecture, basing our ideas on the suggestions given by the discovery of certain remains of the work of these ancient miners, and by the analysis of the objects revealed after being hidden for perhaps thousands of years before history commenced.

The people who originated and conducted these earliest mining operations have passed away as if they had never been, leaving no human remains or

anything by which we can judge what manner of men they were. This is a curious fact, for they must have lived, and in some form of community, and begotten children, and died, and however savage or unintelligent they may have been, as compared with the average man of to-day, they were at any rate intelligent and skilful enough to select the most favourable sites and districts for gold, silver, and other metals, and precious stones, dig for them, and make workings which, crude though they were, were sufficiently substantial to withstand the ravages of time and its destructive influences; the weather, earthquake, landslip, and other shock; and, after the lapse of more thousands of years than one may even estimate, show on discovery some of the methods and tools employed.

So ingenious are some of these, that it is extremely disappointing to be without any kind of evidence of the people themselves. For it would be distinctly interesting if, by the finding of a few human bones and skulls amongst the tools and other remains, some idea could be gathered of the mental and physical state of these, perhaps the oldest of the pre-historic people of the earth.

It cannot be that their bones have perished by the action of water, dampness, or the general chemical change which goes on continually in and on the earth,

for human bones are of the same substance and composition as are those of animals: therefore, if the miners had been buried in or near the caves or mines, their bones would have been subjected to the same influences as those of the animals which have occasionally been found there, and the one could scarcely have survived to the total exclusion of the other, even allowing for the animal bones being left there at a date long after the miners had vacated the scenes of their labours. It so happens, however, that in some of these, the earliest of the early mine-caves, there have been discovered animal bones and teeth which have been used as tools. So that the generally accepted explanation is that these early workers burnt their dead, and finally, when the survivors found the workings give out—that is with regard to the smaller pieces of metal with which they could deal with the limited means at their disposal—they gradually left the locality.

These caves and workings, being no longer protected, became the haunts and lairs of wild and shelter-seeking animals, who in turn either left them or became imprisoned there by illness, landslips at entrance, falls of roof, and the like. There they died, more or less miserably and painfully, their skeletons to become exposed to the eyes of the prying archæologist many centuries later, telling him, as plainly

as if in actual words, the kind of creatures they were, their habits, how they lived, and all he loves to know. Many of these relics of a pre-historic time relate stories of exciting and tragic adventure, one of which may be cited :—

In one of these ancient cave-mines a large animal, whilst alive, and probably whilst still asleep, was covered by a fall of earth and settling and breaking beams, a huge splinter from one of these latter penetrating the creature's flesh and the cartilage of its knee-joint. Being very powerful—as is evidenced by the strength of its limbs and the size and position of the muscle attachments—it forged its way through the many tons of fallen earth and roof to an open part of the workings ; its passage through the debris of the wrecked portion being observable even after so great a lapse of time. This is proved also by the fact that amongst the distant portion of the wreckage was found the beam, from which the splinter in the beast's knee had been torn, in the broken space of which the splinter fitted perfectly, allowing, of course, for slight incrustation and decay produced during the long time that had elapsed. It was also noticed that the beam was composed of a portion of a perfect, unbarked tree, which had been brought to size by fire, the twigs and branches having been pulléd and burned off, fixing the date anterior to that even of stone tools. The stake of sharp wood must therefore

have entered the animal's limb at the time of the fall of roof which had caused the beam to break, and it may reasonably be surmised that the animal was sleeping near the post at the time.

With this, supposition ends, for the rest is undoubted fact. The circumstance of the splinter being firmly embedded between the bones of the knee joint, and only the extreme tip of the opposite end being worn in the creature's passage and struggle through the debris, proves that the whole of the stake was embedded in the flesh, which is not surprising considering the tremendous force with which it would be driven in. This is also borne out by the supposed contour of the beast's body, taking the size of the limbs and the proportionate size of the muscles and their attachments as criterion. Apparent teeth-marks on the upper end and some distance below the chafed portion, may reasonably prove that the beast, once reaching the shelter of the open portion of the working or cave in which it was found, had made frantic efforts to draw out the splinter, even biting deep down into the flesh to get firmer hold with his teeth. These exertions proving useless, and inevitable complete lameness resulting, the animal died there, as imprisoned.

Time and insects denuded it of its flesh, leaving but the skeleton and the significant position of the

splinter. The bones and splinter then became coated with a glassy formation of stalagmite, proving the later access of drippings of acidulated water and ooze from above. Then came more water, this time on the ground, sufficient to wash up silt, for the already incrusted bones now received a further coating of sand and silt from the water. Then came a long period of dryness, after the water had all drained from the floor of the cave ; then the drippings again came from the roof, causing more glassy stalagmitic incrustation to form on the sand and silt present on the bones and the surrounding stones and rocks. Then followed another period of perfect dryness, both above and below, during which no addition was made to the deposit, and at the time of the discovery of this cave and its interesting occupant, though the roof and walls were perfectly dry, stalactites and stalagmites abounded in profusion.

Such is the history of one of these old mines. It is utterly impossible to estimate its age, for even if the period of rest between the various epochs of change could be ascertained, the time taken for the several incrustations to form could not even be conjectured. All estimate must be based on the quantity and flow of the oozing, the quantity of lime held in solution, and the rate of evaporation. It has been found by actual measurement and calculation that some stalagmitic growths, where the amount of lime

brought down is great and the evaporation is rapid, form at the rate of one-sixteenth of an inch in six months; whilst others, where the solution is weak in lime and the evaporation is slow, show a deposit of but one-sixteenth of an inch in one thousand years. Nor are the size and contour of an isolated specimen of an animal any criterion, although they prove a great aid in determining data; for the various eras and periods of the world's history glide so imperceptibly into each other, that even a mammoth may not necessarily belong to, or have lived in, that bygone time known as the "Mammoth Period," seeing that we have decadent specimens of these huge creatures living at the present day, in the elephant, the giraffe, the giant elk or moose, the whale, and such-like animals, which, familiar as they are by sight and repute, are real, though somewhat modified, descendants of similar creatures living in the Mammoth Period.

CHAPTER II.

THE MINES AND MINERS.

SAVE by accident, it is by no means an easy matter to locate these old mines, whether they be of gold, silver, or copper, or of any other metal, for in many cases they are overgrown with timber,—tall oaks and other forest trees—and the underwood of many centuries has hidden every vestige of them from view.

In other instances where mines have been located on mountain sides, rocky declivities, and on broken ground, time has softened the rawness and all evidence of excavation. Storms, landslips and the general displacement of lower rock — by water percolating through the division-planes and so loosening large masses—have also all helped to fill in the small and narrow slits and cracks which once formed the entrance to perhaps a wealthy gold mine. The ancient miners—having no hauling arrangements at their disposal, and no tools save those of stone, which were used in the later mines—were in a great measure compelled to take the minerals as they came,

as chance revealed them, without much possibility of altering any of the conditions, or of making their work easier.

Thus we find they took advantage of any narrow cracks in the rocks, such as a division-plane, which could be enlarged, and this they proceeded to do, by driving into the crevice a stake of timber, with stone hammers called "mauls." These stakes or wedges were then sluiced with water, which expanded the wood to such an extent as to split the masses of rock, thus making possible an entrance to an existing cave or passage between the rocks. In such manner was the interior opened out, till in time a more or less extensive mine was made. All this must have been a most laborious task, which could not do other than absorb an enormous amount of time and patience.

Savage and ignorant as we have been taught from our youth up to consider these early races, they do not appear to have made any mistakes. So far, almost without exception, all these old mines which have been discovered, have proved rich in the extreme, whether they have been of tin, copper, silver, or gold. The people, by some means unknown to our present enlightened age, knew what was beyond the surface mass, with certainty, rather than by mere shrewd guess work, and, in many cases, they must have spent years before reaching the object of their labours.

Even when entrance was effected, the miners were limited to the extraction of that which alone was capable of being dealt with by hand, aided by a rude stone maul and a wood wedge. All the bulky pieces had to be left, and are there found to-day. Especially is this the case with copper, for in many old mines copper of great richness is obtained in pieces hundreds of pounds and tons in weight, many requiring elaborate devices to dislodge and bring out of the mine, having been totally beyond the powers of the early workers to disturb.

It is not surprising, therefore, that these ancients should have conducted their mining operations chiefly on the upper portions of the ground, and only penetrated the rocks where naturally existing fissures gave them more or less easy access. So we find that those mines already discovered, have, in most instances taken the form of shallow pits, cavities and trenches, often but a few feet deep and wide. Consequently, these are exceedingly difficult to locate, for the place where a rock has broken away from a hillside and left a cavity or merely a depression, or the hollow left by an overblown tree, might appear, to a person unacquainted with the cause, to be one of these old mines.

The miners, also, when working in trenches and pits, often filled in behind them as they proceeded, the earth and stones dug out in front, so that the

result in some cases was still a perfect level, with a shallow, pit-like depression at the far end only, and even that with little or no indication of the direction the trench had taken. In other cases, these lines of trenches became mere ridges, or a long line of depression caused by the gradual settling of the stones which, at the time of filling in, may have been level, whilst in others, such a site will be located by a mere heap of stones.

In districts where grass or vegetation is luxuriant, these hollows would quickly become grass-grown, then covered and filled in by deposits of leaves and twigs blown and retained there by the wind, so that before many years could have passed, all traces of such an excavation would have vanished completely. Whilst in barren districts, in an equally short space of time, the action of the sun and the weather generally would soon destroy the new appearance of the freshly-broken rocks, and reduce all to the same state as regards colour. The only evidences at all likely to remain, are found in the mounds of stone. This shape, as is well known, is the most permanent; no other is so substantial, or resists so well the ravages of time and storm, and therefore, in the great majority of cases, such mounds remain intact to the present day.

But in these instances, also, time's softening hand, which deals so kindly with all crude newnesses, trans-

forms the heaps and mounds of newly-turned earth and freshly-broken stone, to shrub and grass-grown hillocks, or to heaps of weather-beaten stones which, to all appearance, have grown with the surrounding country and are of the same age.

Therefore, the task of locating any of these old mines, even in districts where they are known to exist, is almost a hopeless one, and must now be more a question of judicious guessing than a selection from outside evidence, for it is obvious that, even in a gold, or other mineral-bearing district, every mound, ridge and depression, cannot be cut into and opened out on the merest chance of finding an old mine.

As before remarked, the mines, when found, in almost all instances open up valuable lodes, and happy is the prospector who, by chance or design, happens to find one of them, for of all people the world has ever known, including those possessing the advantages of science, the miners who have gone, and left no relic of themselves, were the most expert of workers, and are gladly followed to this day.

Like the somewhat earlier miners already described, these later, though still early pre-historic workers, have left nothing by which we can tell what manner of men they were All is hidden in the great and mysterious past. In order to carry on the work done by them, they must not only have been very

numerous, but extremely hard working, and must have laboured at the mines for a considerable period. They depended largely, if not entirely, on the chase for food, because as yet there is no evidence of their having cultivated any land in the vicinity of the mines; no ruins of buildings exist; there are no defences of any kind; no waterways except natural ones, for the earliest roads and canals in the various districts were made long after their time, and it is a matter of history by whom, and at what period, these were constructed.

These people also, appear to have lived in the open, and in and near the mines in which they worked, their time being entirely occupied in mining and hunting, their weapons of defence being composed of stones tied with rushes to springy twigs; their mauls were made of hard stone, granite and flint; some of these were used by hand as colour-grinders now use their mullers, and some were tied to wisps of creepers and softened twigs, by means of one or more grooves ground round their sides. Others, again, are of great weight, and were evidently tied to long, willowy reeds, which enabled them to be swung round by one or more workers, to fall crashing on the object which it was desired to break.

The sharp, piercing, or cutting instruments were made of pointed flints, split flints, horns of animals

broken and tied into cleft sticks, teeth of animals similarly mounted, and in several instances some creatures' blade- and jaw-bones, worn to a state beyond all classification by being used as scrapers.

Beyond this fragmentary knowledge obtained from the objects discovered in the mines, supplemented by the appearance of the workings, nothing is known of these ancient miners—the pioneers of the science; the people who have vanished from the several districts in which their lives were spent, as the mist scatters before the rising sun, leaving no trace of its presence save the work it has done and the manner of the doing.

CHAPTER III.

THE MINES AND MINERS

CONTINUED)

After these pioneers, we find that the later miners, though still pre-historic, possessed and used tools of copper.

In almost all parts of the world, copper exists native, none of it absolutely pure, yet of excellent quality. With no tools other than stone, teeth and horns of animals, it was not possible for the miners to dislodge and carry outside, pieces of mineral of any great size, as already mentioned, nor could they deal in any way with the pieces which could reasonably be called "lumps." Their attention and search were, therefore, of necessity, strictly confined to those pieces of such size as could be beaten into workable shape by stones (mauls). Consequently, we find these later miners used knives, chisels and wedges of copper, beaten by stones into certain degrees of effectiveness.

In such caves, the implements discovered, as well as the manner in which the work there was undertaken, show a series of decided changes or developments. Whereas in the older mines, the sides were evidently worked by means of water-expanded wedges and by striking with stones; the earth, rock and stones loosened and split by means of pointed sticks, teeth, and hammers made of stone,—alone or twig-tied; in the later caves, the sides have been worked extensively and with tolerable smoothness by copper chisels, the heads of which have been flanged over, or "mushroomed," under the long-continued action of blows from lumps of stone and copper, and from stone mauls.

In some of these caves such chisels and wedges have been found, and alongside them, heavy masses of copper, as much as a man can lift, are indented and scarred by being used as hammers, with which to drive home wedges and the like. In addition to these, are also the plain, wisp-tied mauls of stone, as found in the still earlier mines, some of the mauls having one or two grooves round which the water-softened twigs had been wrapped and tied. These again are split and scarred on their striking surfaces, the fractures being produced by coming into contact with metallic objects and not wood or stone, as in the still older caves. Further, the metallic streaks

and deposits on the striking surfaces, are shown by analysis to be of the same quality and composition of copper as those of the chisels and wedges found near them. Though this striking of heavy copper wedges by the stone mauls enabled better and more extensive excavations to be made, it was very wasteful of the mauls, and in and around these caves, the broken mauls may be found in much greater numbers than in those in which the copper tools had not been used.

The question naturally arises as to what was the object of the work of these early miners, and for what purpose was the metal wanted. Coinage there was none. When no land was tilled; when there was apparently no commerce; when, so far as we know to the contrary, many countries were in a barbarous, or at least a semi-civilised condition, the wants of the people must have been so few, that the mining of gold and silver as a serious business or occupation, seems on the face of it to have been altogether superfluous.

The racial conditions, however, were most probably the same then as to-day,—where, in various places in the world, there are enlightened, highly intelligent people, whilst in others, there are, even now, races of men who are undeveloped, and little better than wild beasts, yet undoubtedly human beings; and there are examples existing at one and the same time, of all

stages of intelligence between these two extremes. Indeed this rule holds good throughout nature, for undeveloped, degenerate, as well as highly perfect forms of life are present simultaneously in both the animal and vegetable kingdoms, all the world over. Considering that this state of things has existed since the first recorded history, and still exists, it may reasonably be supposed that so far in the past—in this ancient pre-historic time referred to—these early miners bartered their hardly-earned gold, silver and precious stones to more luxurious races, who came for it, or to whom they took it, and perhaps were not allowed to return, eventually ; for putting aside fancy or conjecture, the total absence of any of their remains, as we have observed, is significant. These miners do not appear to have used any of the precious metals themselves, for all traces of the gold and silver obtained, is as much lost as is that of the workers.

Another significant feature exists, on which, if fancy were allowed to play, such a glamour would be cast as would eclipse the facts which discovery has established. This lies in the previous suggestion that these miners themselves took away into a far country, the precious stones and metals they had striven so hard to procure, and were finally detained and put into slavery for their pains. Travelling in those times would be a serious undertaking, even for those un-

doubtedly clever, yet primitive people, and it is not straining supposition to say that they would travel in bands and communities, both for mutual comfort and protection. Everything suggests that they were nomads, and that they stayed on the spot sufficiently long to obtain enough metal to carry away with them, and no longer. However this may have been in reality, many of the mines were undoubtedly closed and their entrances hidden by the miners themselves, for evidence shows that the openings of many of these rich mines had been deliberately closed by hand, as well as covered by nature. The only conclusion possible to draw from this fact, is that the intention was to hide the mines and keep them secret during the miners' absence, and this adds considerably to the already enumerated difficulties of locating these ancient mines.

Therefore, taking the facts as they stand, it is by no means unreasonable to conclude that the people lived in a kind of roving community, mined, and departed with their work to some distant land, or they would scarcely have built their mine entrances up and left no one in charge ; perhaps to do this several times, because some of the entrances show various kinds of undergrowth, which would suggest a period of at least a year between the visits. At last, however, they, could not return, their secrets being kept so securely

that during the many thousands of years which must have passed away since then, only a few of the mines have been discovered, and with one exception, by accident—even the one exception could almost be called accidental, since a previous landslip had revealed its presence.

The later caves are more numerous and had been abandoned as left, but in most of these cases the minerals were of the common kind, such as of copper. These caves also at that time would be considered secure, because no attempt was made to disguise or hide their position, and it is in such as these, of this somewhat later period, that copper tools have been found.

Some of these tools are most ingeniously wrought, considering that the copper was hammered from the lump by beating it with stones. The metal was first brought into the sheet, this sheet was then turned over and round a stave from a growing tree, much as shovels are dealt with to-day. In other cases, the metal was hammered into triangular or wedge-shaped strips, forming a knife with a thick back, the tang-end being hammered out into the form of a flat spiral or gong, into a twist, and other devices, to form a handle.

In some of these mine-caves have also been found rough-hewn wooden bowls, used for bailing out water, together with wooden beams or slides, on which the water or excavated earth was conveyed outside, after

the manner of the modern chute. Here also were found various implements of the chase, in spear-heads tied to sticks and held between cleft sticks by thongs of reed, twigs and hide ; also in small lumps of copper which had been roughly brought to shape by hammering, evidently used as weapons thrown from rush-twisted slings. Some of these lumps, when found, had, and still have, creepers and strips of hide tied to them, and it is possible that these also were used as some kind of throwing-weapon, the other end being retained in the hand, as the thongs or creepers are not sufficiently long for them to be used as a lariat.

Here again, though tools and implements appear in plenty, and an occasional skeleton of an animal, no evidence appears to be forthcoming as yet of any of the miners themselves.

Like their predecessors, they lived and worked and in great numbers ; hunted and feasted, but built no homes ; they had no forts or other defences, though they had weapons in copper knobs, knives, spears, daggers, and the like ; they tilled no ground ; cultivated neither trees nor plants ; erected no funeral piles ; were apparently not buried ; and though leaving what is proved to-day most valuable evidence of their presence, they themselves, like their predecessors of the same craft, have vanished as if they had never been.

CHAPTER IV.

TOOLS AND METHODS.

In certain excavations made on the sites of some of the cities of the Canaanites, there have been found many vessels of native copper, as well as implements of the same material in the form of knives and spears. Examination of these shows that at the time all these were made, even the rudiments of metallurgy were quite unknown, the copper being in the state in which it was found in nature, the objects being formed from it by hammering the metal with stones and larger pieces of metal. Where joining could not be avoided, the joints have been brought together and secured by nails or rivets of the same hammered native material.

Almost all this metal contains copper, tin, iron and lead, and a considerable quantity of sub-oxide of copper, the presence of which last opens out a wide field for discussion and conjecture. The implements and vessels owe their hardness and general efficacy to the presence of this sub-oxide, and how it entered into the composition of the metal is a mystery, for metallurgy was unknown, and such a quantity could not be

present naturally, or the tools could not have been made, for they are too hard in temper to have been *worked* into their present shape. So that the only reasonable theory, therefore, is that after they were beaten into the desired form, they were subjected to some hardening process by oxidation. Indeed, no other conclusion is possible, for these copper vessels and the like, will cut and work stone and iron, but the secret of the process is lost to us.

So far as can be ascertained, gold appears to have been the metal first discovered, then silver, copper, iron, lead, and tin, or maybe the tin before the lead, for these two last are not by any means so clear as to their origin as the others.

All were considered to have great affinity with the planets, and were dedicated to them by the early alchemists, as follows:—Gold, for obvious reasons, was dedicated to the sun and figured very extensively in the rites of sun-worship. It was called Sol, and to it was given the astrological symbol of the Sun, ☉. Silver, from its pale and placidly-shining surface, was dedicated to the Moon, and even to-day, these two are associated by such expressions as the "pale and, silvery moon." Silver, therefore was known as Luna, and Diana, and by the sign of the crescent-moon, ☽. Copper, coming in quantity originally from Cyprus, was dedicated to the presiding goddess of the

island, Venus, and known by the symbol, ♀. Iron could scarcely be dedicated to other than the iron-handed god of war, Mars, whose ruddy light was considered as being like red-hot iron, so we find this metal was named Mars, and was known by his sign, —called by some a "flying-shell"—♂. Lead, from its gloomy heaviness, seemed to these early alchemists a type of evil and malignity, and was therefore apportioned to Saturn, and known by his sign, ♄. Tin, from its brightness and the peculiar crackling sound of its fibres when bent (likened to the rustle of wings), they dedicated to Hermes; but the later alchemists, at least since the year 500 A.D., called tin, Jupiter, and Zeus, and gave it the sign of this planet, ♃.

We find the ancients' ideas somewhat curious with regard to metals, in that they were supposed to be caused by the ingress of air into the bowels of the earth, and therefore the deeper the distance penetrated, the purer and more prolific would be the metal and the richer the metalliferous ore, and Aristotle supports this belief. In this way they accounted for the various degrees of purity in which metals were found, taking those cases where the purer metal was near or on the surface and the less pure deep down, as being exceptions to the general rule, and caused mostly by earthquake, landslip, volcanic action, and the like.

In the consideration of the metals first known to the ancients, or supposedly first, their characteristics and properties may here be passed over, the attention being held more to the manner of mining for them and the method by which they were reduced from their ores and refined—in so far as history records the facts. It will, however, readily be understood, that in the oldest of the ancient methods, hieroglyphics give, in many instances, the only records, and though it is well known that metals were, at any rate, melted by firing in a more or less crude manner, and were even occasionally smelted, the methods employed are lost in antiquity.

Turning to Biblical history, one of the earliest references to gold is found in the description of the Garden of Eden, in Genesis 2 v. 12. This speaks of gold and "good" gold, by which an inference may be drawn that other gold was known, but this particular variety was "good," which again must mean the purest, since gold, as gold, cannot be other than good. For even to-day, we speak of fine, rich, good, and poor gold, somewhat loosely, not implying any difference in the *quality* of the metal, as an element, but only in the quantity of it present, as it may be in "fine" or pure, and in its many alloys from "pure" downwards to "poor," or that alloy containing little gold.

It is evident, then, even at that early period, gold was well known, and since silver is almost always associated with it, that metal must have been known also. This supposition is borne out by several references in Job, which some commentators agree is as old as the books of Moses, though contemporaneous evidence and critical analysis suggest 400 B.C. as more nearly approaching the correct date of the Book of Job. In chapter 28, verse 1, Job says, in speaking of the two metals, "surely there is a vein for the silver, and a place for the gold where they fine it," in this, showing a remarkable knowledge of natural phenomena. In fact, the few specimens found of the work of his day, could not be excelled by any workman of modern time. And glancing briefly at the action of nature in dislodging the minerals the earth contains, especially the noble metals, his expression s significant of great knowledge.

Gold is widely diffused in all the primary rocks and neighbouring earth, throughout the world. Being completely indestructible, so far as atmospheric influence is concerned, gold is unaffected by the general decomposition brought about by moisture and air, to which destructive influences its matrix must eventually give way. So that in time, the metal works loose and is brought down from the hills by rain and rivulets into streams, and thence on into

the valleys and plains along with silt. In course of time this silt becomes hard-packed, and the gold also, which accounts for the fact that almost all newly-discovered countries are gold-producing.

It therefore follows, theoretically, and also as experience proves to be the case, that in these newly-opened-out localities, gold is found native in streams, valleys, and adjoining most streams and rivers. Such a spot was that referred to in Genesis, (chapter 2, verse 11) already mentioned, where the river, after leaving the Garden, became divided ; one branch, the Pison, watered and encompassed " the whole land of Havilah, where there is gold." This accounts for the expression in Job, chap. 28, v. 1,—" veins of silver " —since silver and gold go together—and of that in Job, 22 verse 24,—" then shalt thou lay up gold as dust, and the gold of Ophir as the stones of the brooks."

From historians such as Pliny, Dioscorides, etc., we gather that gold and silver were both smelted and refined, but they all omit to give the slightest clue as to the methods employed. This much is certain ; the ancients had evidently discovered that gold could not be injured, but only refined, by heat, and the ancient Egyptians and Phœnicians, being expert chemists, rightly judged that the fiercest heats oxidised all foreign matter and left the gold almost, or

absolutely, pure. To aid this, they scattered salts, such as nitrate of potash (saltpetre), on the surface of the liquid gold, which salt being rich in oxygen and giving it off freely under the influence of heat, aided the oxidising process both of the silver and the gold, and this appears to have been the first of the processes recorded for the refining of the noble metals.

Then we come to another break in the chain of the history of these two precious metals, during which, in both sacred and profane history, we are informed of the uses to which they were put, but all details of the methods employed are lost, though the Bible abounds in references to the refining of gold, silver and the like.

CHAPTER V.

SLAVE-LIFE AT THE MINES.

THEN came the exploiting of the historic mines of Nubia—so called from the Egyptian word "nub," meaning "gold."

These extraordinary gold mines became renowned throughout the whole of the then known world, as being marvellous in their richness of production and the purity of the gold obtained.

They were equally notorious for the cruelty practised on the slaves there. Their history is quite a romance, and certain historians (Diodorus Siculus, for instance) speak of the revolting cruelties to which the slaves who worked in these mines were subjected.

The great wealth of Egypt in its palmy days was supplied from these mines, and in the year 1322 B.C., in the time of Rameses II,—in fact during the whole of his remarkable reign—they alone supplied gold to the value of considerably over one hundred and twenty-five million pounds sterling per annum, on an average, which, added to the other sources of

Egypt's income, made that country the most wealthy in the whole world and its power the most influential.

Running the Nubian mines of the Egyptians very closely were the Phœnician gold mines of Ophir. The situation of Ophir is difficult, if not impossible, to locate, there being at least three factions of authorities on the matter. One fixes it on the east coast of Africa, another in southern India, and the third in Arabia, at Midian.

About this time (1322 B.C.) and during the whole of the reign of Rameses II, the gold was washed with water, sometimes on a stream bed, often in bowls of wood or hammered metal, and sometimes on coarse flannel, and those portions not readily separable from their matrix were scorified in the furnace. After this, the gold was separated from the silver, copper, and other impurities, by refining in vessels placed in a furnace and subjected to a hot blast—the identical method which we use to-day under the name of the "cupellation process."

This particular reign of Rameses II is of so much interest in connection with the mining of the noble metals, that it should not be passed over without emphasising certain facts which bear directly on the history of these ancient gold-fields and the manner of their working.

Rameses II began his illustrious reign at the tender age of seven. Four years later, when he was but eleven, he distinguished himself nobly at the historic battle of Katesh, where he utterly routed the Hittites and their Syrian allies, and by skilful manœuvring of his forces, drowned the flower of their officers in the river Orontes. Ten years later, at the age of 21, he married one of the Hittite princesses and concluded a treaty of peace with the Hittites, feeling that such was for the benefit of Egypt, especially in the circumstances of the new relationship. From this moment onward he worked harder than ever for the benefit of his people, with wonderful sagacity and forethought.

Then he subdued Ethiopia, but shrewdly feeling that to institute in that country the Egyptian rule and gods, would be but breeding future trouble, he gave back to the Ethiopians their own rulers, merely putting them under tribute to Egypt. In these and countless other directions he endeared himself to friends and foes, and especially to his own people, who considered him a god, which supposition was confirmed in their minds by the remarkable coincidence of the heliacal rising of Sirius, the Dog-star, and the commencement of the fixed and sidereal year, permanently to record which a special calendar was sculptured.

It is almost inconceivable that a man of the high intelligence of Rameses II could be inhumanly cruel to his slaves, for he was so good to his own people and exercised such a wise influence over the interests of Egypt generally, as to earn for himself the titles of the "Peacemaker," and the "Deliverer." The fiendish cruelty to the slaves appears to be the only blot on the character of perhaps the most glorious, the kindest, and the best of all the kings of Egypt.

The slaves were compelled to dig with inefficient tools; to excavate the stones, and work even with bleeding hands and feet; they were subjected to all forms of affront that wicked heart of man could devise: beaten, outraged and tortured in every conceivable way in order that gold might come to Egypt.

Under such cruelty Egypt became vastly rich; rich beyond all dreams of avarice. But retribution was to come, and that soon. Rameses II (the good) died, and his thirteenth son, Meneptah, succeeded him. This latter was the Pharaoh of the Exodus, the one who earned for himself the title of the "devil," in contradistinction to that of his father, though some Biblical commentators prefer to identify Rameses II with the Exodosian Pharaoh.

The accession of Meneptah is interesting in that it is said to be the origin of the ill luck which attaches to the number 13, for he was not only the thirteenth

son of Rameses II, as already stated, but he had the misfortune to be succeeded by Seti II and other monarchs whose inglorious, disastrous, and ignoble reigns, closed the 19th Dynasty.

Every student of Bible-history knows what terrible oppression the Pharaohs, especially Meneptah, put on the Children of Israel, and they were supposed to be an independent people, so the treatment of the actual slaves may be better imagined than described. It is at any rate less revolting. What steps were taken to release the Israelites, and what happened in Meneptah's reign, are too well known to require explanation, but his rule, in contrast with that of his father, was one of the most inglorious of all Egyptian monarchs.

The interest of the moment in the reign of Rameses II lies in the fact that in the year 1322 B.C., is the first mention of the manner in which gold was obtained from the mines, and also the first mention of the metallurgy of gold and silver. Especially interesting is it to find that even at this early date, the methods employed then are almost identical with our present cupellation and quartation processes. That these methods were in common practice then is evident; also that they were continued; for in Ezekiel, chapter 22 verses 20-22 (supposed to be written about 593 B.C.) there is a reference which cannot mean other than the previous, and present, cupellation method.

With regard to the actual operation of mining, this was then, as now, very simple, and was almost exactly like that of to-day ; the chief difference being that these early slave-miners had few, some no, tools, whereas at the modern mines, the same process is conducted by means of up-to-date mechanical contrivances and plant, which reduce manual labour to a minimum, and at the same time extract every particle of gold.

Water was used largely then as now, and the separation of the gold was conducted on simple lines. Bulk for bulk, gold is, roughly speaking, about seven times as heavy as the average general mass of deposit in which the metal is found. The earth, and deposits containing the gold, were washed in a running stream, the while being held in a bailer made from a scooped-out block of wood ; at the same time the rubbish in it was kept in violent agitation by kneading with the hands. Soon the gold would sink to the bottom and from there be collected.

This, of course, merely gave up the free gold, or the heavier pieces of gold still in their matrix. The portion discarded would also contain a little gold, so this hand-washing was done on platforms of flat boards, over which water was caused to flow,—"sluices," as we should name them to-day—and as the slaves were standing all day in strongly running water, which brought down dirt and stones from the

workers above them, their skins became sodden and came away from the flesh, and they contracted many forms of aches and pains, sores and diseases, some of the most loathsome type, but all of which had to be endured without the slightest attempt at alleviation being allowed or afforded.

These sluices were blocked at intervals by transverse beams of wood ; so that while the larger stones and refuse might pass over, the heavier gold and gold-carrying stones would sink ; if carried over one barrier, they would be stopped by sinking below the top of the next, or those following, so that much of the gold would eventually be caught.

The gold not gathered in isolated lumps or dust, but still in its matrix, was placed aside and these gold-bearing ores were roasted by means of blast-furnaces as already described and as mentioned in Ezekiel and in other of the Biblical books.

CHAPTER VI.

SLAVE-LIFE AT THE MINES.

(CONTINUED)

As will be understood, millions of pounds worth of gold must have passed away unchecked, not only along with the earth from the crude washings, but also in the rough-and-ready forms of furnaces used, notwithstanding the fact that the Egyptians at this time excelled in all the arts and sciences, particularly in chemistry and metallurgy.

The consideration of this shows the stupendous value of these Nubian mines, which poured out their gold ready for the mere picking up, giving up their treasure so lavishly, that it was evidently considered not worth while to capture it all, or to take too much trouble, or go to any expense in supplying efficient plant, when almost all that was wanted could be obtained by simpler, if cruel, means, the latter not appealing to the ruler-owners in the least degree.

Comparing their reckless methods with the careful, exhaustive methods of to-day, it may safely be said that had these Nubian mines been run on lines similar to those of a modern mine, the gold taken from the same material extracted would have been at least double, probably three hundred millions sterling per annum.

It is not as if these people had been ignorant of the art of mining. They knew more about that than do we to-day, for science was then at such a height of perfection both in Phœnicia and Egypt as the world had never seen before and maybe will never see again : many of the every-day manufactures and products of the Egyptians alone, known and proved to be as history has recorded them, are so much in advance of present-day discovery as to seem more like fairy tales of science than established fact. But wealth brought luxury and all its attendant evils. Their slaves toiled for them for gold ; gold brought them all they desired and, as is not unusual, the more gold they had the more was demanded ; yet notwithstanding their ever-increasing demands, they were too luxuriously apathetic to consider it necessary in any way to help the slaves to produce more gold.

In the people's state of wealthy indifference it seemed not worth while to spend money in plant, or even to be considerate, when beating, searing with

hot irons, whipping with scorpions, and all forms of torture that fiendish minds could devise, made the slaves work with frenzied eagerness to produce more and still more gold. And as the slaves complied with these brutal demands, more and still more was demanded, till they became frantic, actually breaking their limbs by using them as levers in their mad search for gold, preferring even that to the revolting torture which they knew their taskmasters would inflict upon them if they asked for levers of wood or iron, or failed in their work.

As tools wore out or became useless by breaking, they were not replaced, yet the supply of gold must be ever more, just as the Israelites were compelled to make the same tally of bricks, though the supply of straw was not renewed. The Israelites, however, were happy in comparison with the slaves at the gold mines, where the case was far worse. As the bailers split or otherwise became useless, each robbed his neighbour; many had nothing but their scanty clothing, which they tore off in order to wash the earth on it; then they were naked and without anything on or by which the work could be continued. No excuses were considered: the gold had to be forthcoming in increasing quantity or the slaves were cruelly tortured, and the bravest human being, whose mind is so strung, and whose will is so stoical, that he can endure the greatest physical pain and suffering

with the utmost fortitude, will collapse entirely, in abject fear, at determined and long-continued torture.

When it is considered that the majority had no tools except of their own making, or stealing, and no appliances, almost everything having to be done by hands and feet and by brute force, it is no wonder that the hearts of historians were wrung with pity for these wretched creatures, and with hatred for their oppressors.

In refinement of cruelty and variety of torture the practices of the dreadful Spanish Inquisition must sink into insignificance beside those of the taskmasters to these slaves at the mines.

Owing to the many and long wars, the summary treatment of captives, and by the Egyptians themselves of their own native prisoners, and the fickleness of favour, the slaves came to the mines in battalions. In consequence of this unfailing influx, the taskmasters and overseers devised every conceivable form of cruelty in order to obtain increased output, and to such purpose that the slaves worked like the madmen they almost were—mad with fear. Many succumbed to their agonised sufferings, falling at their posts like smoke-killed flies, their places being taken by fresh batches of slaves. In a very short time, these also had their spirits, minds, and bodies, broken, working

madly with the rest, just as in certain cases, an already willing horse will kill itself with work, merely that it may escape the dreaded torture which it knows its owner, its brute-owner, will inflict at the first sign of flagging.

So did these human beings become converted into terrified, helpless creatures, working without the least glimmer of hope ; the fate of their companions showing them all too clearly what theirs would, and must, be ; never knowing at what moment they might be horribly tortured, hoping it would be to their deaths, that their sufferings might be ended : or beaten so unmercifully that the bruised and broken body would be of such little service for mining, that it would be flung aside to live or die as best it might, its place being taken by another, and the process repeated.

It will be recalled how Moses, the favoured adopted son of Pharaoh's daughter, slew an Egyptian who was cruelly beating one of the Israelites—as recorded in Exodus 2 verses 11-15. Though Moses was a powerful prince in Egypt, he had to fly for his life. This but shows how useless was appeal ; even if absence from the mines would have been allowed, there was no redress whatever. The punishment meted out to the slaves for even trivial faults, such as a scornful or angry look, was sudden and severe, usually taking the form of torture or mutilation. The victim was

then sent back to his work and compelled to produce the stated minimum quantity, notwithstanding the mutilation, or further torture or a lingering death followed. Slaves were plentiful, life was cheap; and the taskmasters had unlimited power to compel the harvest by any means their fancy might devise.

It must be remembered that these Nubian mines produced enormous diamonds, rubies, and all manner of precious stones, all in vast quantity, and history records that after some of the slaves had found large rubies or other stones, they were compelled to find others almost at once. Foolish as this was, considering that these stones do not necessarily lie together in packets, as it were, gang after gang of slaves would be goaded and seared with red-hot spears and often entirely sacrificed, if they did not quickly comply with the insane demand. This torture made the slaves work feverishly, and only ceased when further finds were made: when carried so far that the slaves were completely incapacitated, they were taken away, cast aside like vermin, and fresh gangs continued the work they had left.

So this mad rush for wealth went on, went on for hundreds of years, but just as no cause is without its later effect, so did Egypt begin to suffer; and as a hill must be descended after the top is reached, so Egypt began her sure decline.

From the wealth without count which was hers; from her unique position in art, learning, and science; from the honour and success obtained during the glorious reign of Rameses II, which had lifted Egypt to the very zenith; from all this height of fame and excellence the valley beneath was all the deeper down. Just as surely as the sun must set and night follow, so surely did Egypt fall rapidly to the lowest possible depths, for in the gathering gloom of succeeding wicked reigns, she fell quicker and ever quicker from that high altitude on which she had stood, a light and beacon to the whole world, and set to rise no more, but covered herself with the darkness of oblivion, her people becoming scattered as chaff before the wind, and lost irrevocably.

CHAPTER VII.

THE WEALTH OF THE MINES.

On the turbulent sea of history Egypt came and went; passing as a ship in the night, showing its magnificent proportions and dazzling lights, and then a slow fading away into the darkness; so Egypt has left little more than a memory of her greatness behind her. But of the wealth of her glory, the whole world will always speak with bated breath and the sparkling eye of amazement. The Bible is full of it. Both sacred and profane history—even in the days when what now seems wonderful and astounding were but common occurrences—abound with records of the almost inconceivable wealth of Egypt, obtained chiefly from the gold, ruby and diamond mines of Nubia and, indirectly, from the Phœnician gold mines of Ophir; all of which also yielded silver, diamonds, and other precious stones in great abundance.

At this time, even ordinary middle-class people had complete furniture made of gold of great richness, much of it virgin or pure gold, and those of

even less social standing often possessed tables made entirely of, or overlaid with, gold of rich quality, to fine or pure gold—for it has been seen that the metal was purified by means of lead and silver in those days, exactly as is done in our own time by the cupellation and quartation methods.

On turning to sacred history, we find many Biblical references to lavish wealth, and to the wealth displayed in common objects, even when cheaper metals would have answered the purpose better and have proved more satisfactory, which suggests that gold was more easily obtainable than even iron and steel, at any rate in some places, for in 2 Samuel, chapter 8, verse 7, there is the passage :—"And David took the shields of gold that were on the *servants* of Hadadezer," this being about three hundred years after the date mentioned in the last chapter, or about 1040 B.C. ; and it will be remembered that Haman, the enemy of the Jews, was so extremely wealthy as to offer ten thousand talents of silver to king Ahasuerus for permission to persecute the Jews (Esther, Chapter 3). The Hebrew talent being worth from £340 to £396 sterling, and the gift being of pure silver, the value of it would be nearly four million pounds sterling, and some idea of Haman's wealth may be gathered when it is considered that he gave this great sum, without even feeling its loss, merely to gratify a vindictive fancy, and up to the time of his

ignominious death, he continued to spend other vast sums in the execution of his sinister designs on these innocent people, when the gift bought him permission to do so.

Biblical history also records that after all the various gifts presented and collected and dedicated to the service of the glorious temple of Solomon had been amassed, David gave out of his *personal* wealth, (I Chronicles, chapter 29, verses 2–4) in addition to his many other costly gifts:—"Three thousand talents of gold, of the gold of Ophir, and seven thousand talents of refined silver, to overlay the walls of the house withal."

It is somewhat difficult to fix the exact value of a talent, as it varied slightly in different countries, but the Hebrew talent of gold was worth £5,475 sterling, the common silver talent £342 3s. 9d., but of pure, refined silver, £396, though this last-named, refined silver, is stated by later historians to be of the value of £400 sterling. So that three thousand talents of gold would be worth £16,425,000, and seven thousand talents of pure silver at £396 to the talent would be worth £2,772,000, making David's personal supplementary donation of gold and silver alone over nineteen million pounds sterling.

Hiram, King of Tyre, also gave four hundred and twenty talents of gold as his donation, amounting to

£2,299,500, (I Kings, chapter 9, verses 26–28), sending his ship specially to the mines of Ophir to fetch this.

The Queen of Sheba, too, gave Solomon one hundred and twenty talents of gold, equal to £657,000 sterling (I Kings, chapter 10, verse 10), in addition to costly spices and precious stones "very great store."

All these were truly royal gifts, and significant of the great wealth which abounded in those days, chiefly from the gold and silver mines; wealth so common that some of the then merely well-to-do would be considered fabulously rich to-day.

Turning to profane history, we find Aristotle recording that in a barter of oil, the exchange was made in such an enormous quantity of silver that the people in the ships were at a loss what to do with it. Finally, instead of throwing it away, or leaving it behind, they discarded their own anchors and used instead great masses of silver, which acted as drags or anchors.

Rawlinson, also, writing on the richness of the palace of Persepolis, says the throne was gold, under an awning supported by massive pillars of gold, heavily set with jewels. Also, in the temple of Belus (Baal), in Babylon, was an image of the god made of refined or pure gold. This stood in a shrine of pure gold, and before the god rested a massive altar of

pure gold. Opposite this, in the same shrine, was a magnificent pedestal and massive throne, and beside them stood an enormous weighty table; all these being made of solid pure gold. There were other altars in this temple on which sacrifices were made; these also were of solid gold.

In addition to these were many other altars and private shrines of pure gold, many being so covered with precious stones that the pure gold on which they were set, was almost, and in many places entirely, invisible. It was from here that history records how Xerxes stole a magnificent statue, twenty feet high, of solid pure gold, murdering its protecting priest.

Homer, who was almost contemporary with David, also describes many citizens who made lavish use of gold in their own homes; and Pliny gives the value of the gold and silver spoil alone, taken by Cyrus at the conquest of Asia, to be one hundred and twenty-six million sterling.

Further, history records the marvellous wealth of the palace of Ecbatana, the roof of which was nearly a mile in circumference, and this was completely covered with "tiles" made of pure silver; all the pillars supporting this great roof were massive in their proportions, and these, as well as those in the palace itself, were covered with "scales" (tiles or

plates, not thin sheets), of pure virgin gold and silver. Though much of this wealth is scattered and lost, many excavations in Ecbatana and district have revealed vessels of marvellous richness, both of workmanship and material, and treasure of great value; and it is a matter of no little conjecture how some of the buildings could have become buried *en bloc* in sand, earth, rock, and the like, without injury.

History also gives us accurate descriptions of the Babylonish statues to Juno, Jupiter and Rhea, which were of magnificent proportions. These were of solid, pure gold, and each had its altars, shrines, tables and other furniture, cups, drinking and sacrificial vessels, all of pure and solid gold, the combined weight of which, according to the Hebrew value of talents, would be worth over one hundred and fifty-five million pounds sterling. All these were the gifts of private individuals, whose wealth came almost exclusively from the mines of Ophir and Nubia. In many instances they were the spoil of battles; in others the spoil of robbery and bloodshed, as in the case of Xerxes, but all originally were the wealth of the owners of the mines and of those who paid these owners heavily for the rights of working the mines.

These few references to the sacred and profane history of the wealth derived from these ancient, but now lost, mines, would not be complete without

mention being made of the historic holocaust of Sardanapalus, where, in the magnificent heap of burning ruins of goods and human beings, actual treasure to the value of fifteen hundred million pounds sterling was destroyed—all the wealth of this one king, who, having strongly opposed Arbaces, the rebel governor of Media, and finding it impossible for him to defend Nineveh, set fire to his palace and burnt himself, his wives, families, eunuchs, household and all his treasures, in one great pile in the palace court.

As already mentioned, from the time of Rameses II, or a little before, there seemed to be a raining of gold and all manner of wealth; which profusion reached its height in his reign, or about 1322 B.C., and this continued with gradual abatement for fully six or seven hundred years.

During this period, in many districts, gold could simply be picked up and taken away. Of this time, Lawson relates in his "Scripture Gazetteer," that in Iberia the Phœnicians found gold so plentiful, and so near the surface, that it was only necessary to scratch the upper soil for the precious metal to be revealed in great abundance, and mining, as the word is understood, was altogether needless. Later, however, when this profusion was exhausted, the Phœnicians then commenced actual mining,—"and the fate of the Iberians afterwards became deplorable."

As in the case of the wealth of Ecbatana, all this accumulated treasure is now scattered, much of it lost for ever ; some of it has been found occasionally where it was hidden, in caves, and deep in the earth ; some authorities also assert that the greater part is guarded by the implacable sphinx and pyramids, and would be readily obtainable could their secrets be discovered.

The very mines from which the treasures of gold, silver and precious stones were obtained, are not even located to-day, though some scientists are convinced to the contrary and assert all their treasure is exhausted. Others, again, are still searching for these mines,—the marvellous gold mines of Ophir, which supplied the Temple of Solomon with its chief wealth ; for the Nubian Mines, which were the cause of Egypt's fall ; for the wonderful diamond and ruby mines of the Egyptians, the Phœnicians, and the Persians ; but so far, all attempts, even at location, have been utterly unsuccessful.

Yet the districts of Africa and Arabia, even to-day, specially evidence the unthinkable riches that lie there, in gold, silver, diamonds, and other precious stones, and it is the dream and desire for possession of some of these ready aids to wealth which has led to so much sorrow, disappointment, crime, and evil generally.

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