

nature, as interesting in its incidents, as powerful in its morality, and as captivating in its style and language as anything of the kind to be found in writing (forgive me for turning your drawing-room into a church-pew, and this paper into a pulpit)—he thus proceeded:—

Amongst all the precepts to be found in the Old Testament, none is of greater import to social good, and to the curing of social evil, than that which Joseph impressed upon his brethren at parting—"See that ye fall not out by the way." It was an integral part of that doctrine of loving one another, and of doing unto others as we would they should do unto us, which was afterwards enforced to reiteration in the inestimable discourses of our blessed Redeemer; and which, as regarded our neighbour, he pronounced to be both the law and the prophets. Himself a victim redeemed from the cruel consequences of dissension, Joseph felt the most tender solicitude for the peace and harmony of his family. From of old, the sad effects of anger and malice had been so terrible—from the death of righteous Abel, to the times when God said unto Noah, "The end of all flesh is come before me, for the earth is filled with violence"—and thence to the times of the treacherous and cruel deeds of the sons of Isaac and of Jacob, that Joseph's injunction to his brethren, and indeed, the only moral precept which the occasion prompted to him, was that which supplies my text—"See that ye fall not out by the way."

To what horrors, alas, has the neglect of this precept given birth! To what a pitch of violence is the earth again filled by the evil passions of men!—The heathen—not only the idolators of false gods, but the contemners of the known and true God—furiously raging together; the secret assassin bending his bow and making ready his arrows, that he may privily shoot the righteous; the stony-hearted tyrant, or the unrighteous judge condemning the innocent blood; and the armies of the kings and rulers of the earth, going forth as delegates to decide disputes about a landmark or about lines upon the trackless sea, by the slaughter of thousands and tens of thousands, and by the torments of innumerable wounds!

Nor does the demon of discord delight only to lurk in the hiding-place of the murderer—to raise the tempest of anger in the furious homicide, or to fan with her broad wings the fire of the battle-field—but she delights also to fright away all the lovely kindred of peace and charity from courts and cabinets, from churches and colleges, from senates and halls, from the palaces of the great and the lowly roofs of the poor.

Oh Thou who hast called us to Thy heavenly Canaan, how do we affront Thy fatherly loving-kindness in thus falling out by the way! By what demoniacal possession is it, my brethren, that we go not on our way rejoicing?—rejoicing in the universal harmony of families and nations, going the same road to a blessed immortality!—to the bosom of our father and our God!—to a re-union

with all that were most dear to us upon earth, and for whom some amongst us have long mourned, but not without hope—the wives of our of our widowed bosoms—the children of our bereaved hearts!—

There, reader, the good pastor's voice failed him. There, his quick imagination presented him with a bright and piercing vision of his departed wife and child; and that vision smote upon his enfeebled heart like the lightning, and that fountain of his life was broken up. And there I see his spirit wafted away. Yes, there, in the crystal empyrean, I see his faithful Mary receiving him with a look of most profound tenderness, and pointing upwards, whilst she appears to be assuring him of his welcome in the house of many mansions—and his beloved child, bright as the glory of heaven, and joyous as the bliss of heaven, leading him along to his new abode—as the blue-eyed boy was wont to be seen on the green meadows of the earth, drawing him with gentle force to the primrose or the violet;—and the good soldier of God going to receive his immortal honors and imperishable rewards, with a countenance, on which are blended awe and hope, reverence and wonder, and joy, and gratitude, and love.

Oh earth, earth, earth! the heavy ponderance of thy dregs draws me down again amidst thy manifold evils of passion and sin, of folly and vanity, of weakness and want, of grief, and misery, and pain. Nor yet do I unwillingly, but I eagerly descend, for, doomed as I am to wander in thy dreary wildernesses of care and trouble, yet am I surrounded by those for whom I must avoid thy deep pits of despair, the mire of thy evil passions, the dark paths of thy injustice, violence, and wrong—and by God's mercy, gently and cautiously lead my little ones along the strait path which alone can extricate us from woes, to which the worst of thine are but as dust in the balance!

OH! SAY, CAN DISTANCE.

Oh! say, can distance quench my love—

That love that burns so true?

Oh! say, can many thousand miles

O'ercome my love to you?

Oh! say, can waters, over which

Man's mighty vessel rolls—

Say, can it separate our hearts,

And tear apart our souls?

No! though no more I see thy face,

And hear thy voice no more—

Although our intercourse by words,

By smiles and looks, is o'er—

Yet not for ever separate,

Our hearts apart are riven—

Our intercourse is now by thoughts,

Our meeting next—in heaven.

F. M. T.

THE MINES.

In a country like South Australia, where there is every probability that mining and metallurgic operations must, at no distant period, constitute a considerable branch of its productive industry, it has become of evident importance to disseminate a knowledge of those principles which are indispensable to the practical development of these newly-discovered resources. From the want of this knowledge, both time and capital have too often been wasted in the most delusive speculations; while, on the other hand, there have been individuals who possessed treasures—nay, fortunes—concealed beneath the surface of their land, but from which they derived no benefit, because unable to perceive the indications of its existence.

Nothing, perhaps, would tend more effectually to the diffusion of practical information on this interesting subject, than the establishment of a *mineralogical museum*, or collection of specimens of every species of ore, as well as of the different rocks or formations referred to in geological descriptions. If such a museum were, under proper regulations, open to public inspection, we should no longer hear of particles of yellow mica, or of mundic, being picked up and supposed to be gold; and what is more, a capability of identifying minerals of real value by their external appearance would become more general, and the chances of discovering them greatly increased. The collection ought to comprise, not only specimens found in the colony, but also others from all parts of the world from which they could be obtained, as objects of comparison; and were the nucleus of it once formed in Adelaide, there can be no doubt that it would be assisted by donations from the friends of the colony in England, who, by laying out a comparatively small sum with Mawe, Sowerby, or some other respectable London dealer in minerals, and also transmitting some of the best books that have been published upon the subject, might materially promote the object.

The practical man frequently affects to despise the aids of science; forgetting that the latter is nothing more than the accumulated experience of numerous practical men, reduced to system and explained on rational principles. Such, indeed, are the sciences of Geology, Mineralogy, and Chemistry, as applied to practical mining.

By the study of Geology, we learn indications of the localities in which particular ores are likely to occur, and are saved the necessity for searching for them at random; we learn also, to a certain extent, the rules for tracing mineral veins with the least possible expense and labor; while, by the study of Mineralogy and Chemistry, we ascertain the nature and composition of minerals when found, and are guided to the easiest and most profitable methods of separating the valuable portion of the matter they contain. It is not the design of the present article to enter

into the details of these matters, further than may be sufficient to exemplify the necessity of studying them ; and as the only ores of immediate importance, of which the discovery in this colony has hitherto been well authenticated, are those of lead and silver, it is to these principally that it seems necessary to direct special attention, in connexion with the general subject.

Geologists have observed, that among the apparently endless variety of substances of which the crust of the earth is constituted, a few distinct classes of rocks prevail, which they have named deposits or formations. What are called *primary* formations, consist of strata, either nearly vertical, or forming angles highly inclined with the horizon. Granite, mica-slate, gneiss, &c., are examples of these formations. They are supposed to have constituted the original crust of the earth, long before the creation of man, animals, or vegetables, and to have been fractured and burst up by subsequent revolutions of nature. This view is founded, partly upon their inclined or sloping position, which causes them frequently to protrude far above the ordinary level of the earth's surface, although they are evidently the lowest and consequently the oldest formation—the secondary rocks never being found above, but always below them ; but principally on the fact, that they never contain fossil remains, or any traces of organised beings imbedded in their substance. The *secondary* rocks bear every mark of having been deposited upon, and subsequent to those of the primitive class ; but among these again we have evidence of a succession of changes, the proofs of which are almost as distinct as the furrows of a field are indicative that the plough has passed over it. We find, in all these secondary strata, the remains of vegetables and animals, which must have once lived upon the earth's surface ; these, however, are not irregularly distributed throughout the whole series of the secondary formations, but disposed as it were in families. In the lower we find the remains exclusively of animals and vegetables, which are strangers to the present globe. These, although petrified by impregnation with the mineral substances in which they were imbedded, have, nevertheless, distinctly preserved their form. In the strata which cover these, we continue to find the remains of extinct animals ; but they become mixed with those of species which still exist. We find, for instance, the bones of the mammoth and the hyena. In the upper, or newest strata of all, we find only the remains of animals identical with those which now inhabit the globe. Hence, the *secondary* formations have been divided by geologists into the *transition*, the *medial* (in which coal is found), and the more truly *secondary*, such as chalk, calcareous freestone, &c. Besides the stratiform deposits, there are others which occur as it were in irregular heaps, and can scarcely be comprehended in either of the preceding classes.

Lodes or veins are flattened masses which occur in these rocky strata, but do not run parallel with them. They usually cross the strata in a direction not far from a right angle, and as

traverse several distinct deposits, becoming at one time wider, at another narrower, until at length finally terminating like a wedge. Such are the true geological lodes. For the most part they consist of matters totally different from the rocks through which they pass, and they would seem to have been deposited at a subsequent period. They suggest the idea of clefts or rents having been made in the original strata, as if by some upheaving force from below, of the nature of the earthquake or volcanic action, and the vacuities having been subsequently filled up with foreign substances; or else that these substances, while yet in a fluid state, were forced up from below at the time the rent was made, and have subsequently crystallised by cooling. It is remarkable that, in many instances, the main stratum may be observed, on each side of the rent which the lode occupies, to assume a different angle from its counterpart, which corroborates the view that has been above taken. These lodes are principally filled with earthy substances called *gangue*, *matrix*, or *veinstone*, among which the metallic substances are irregularly distributed, either in seams or in detached grains, masses, or crystals.

Several different kinds of lodes or veins are distinguished by miners; and the term vein is usually applied to a small lode. The *rake*, or true geological vein, is that in which lead ore most commonly occurs. This lode mostly runs in a straight line; beginning at the upper surface of the strata, and cutting them downwards further than it can be traced. It usually widens in passing from the superstrata into the calcareous beds beneath. The *pipe* vein does not in general cut the strata across like the rake vein, but insinuates itself between them; so that, if the strata be horizontal, the bearing of the pipe vein will be the same. These veins occasionally contain no metal; but when they do, it may be very abundant. The *flat* or *strata* vein lays between two strata, the one above and the other below. It appears to be nothing more than an extension of the matter of the true or rake vein between the surfaces of the adjacent strata, and consequently it is seldom found to reach beyond a short distance from it. The bulk of the lead ore is derived in England from the rake veins.

It often happens that the mineral vein, after being traced up to a certain point, appears abruptly to cease. On searching to the right or left, above or below, the continuation of the lost vein is again found. This interruption or derangement in its course, is termed by miners a *fault* or *shift*; and the skill of the practical miner is displayed in the readiness with which he pitches upon the direction in which he may depend upon again falling in with it. He examines the adjacent strata, and observes whether they appear to have slipped upwards or downwards, or towards either side, and shapes his course accordingly. Sometimes, a vein is interrupted by another vein of a different nature, which crosses its course transversely; in this case, experience has

shown it to be a general rule, which it is difficult to account for, that the lost vein must be sought on the side where the transverse vein makes an obtuse angle with it.

In Europe, the richest metallic ores generally are found in gneiss (which is a compound rock, consisting of felspar, quartz, and mica, disposed in slates from the preponderance of the mica scales), and in mica-slate. In South America, on the contrary, these ores mostly occur in the transition rocks, such as the clay-shists, the syenitic porphyries, the limestones, and in several secondary deposits; so that it would appear that no general law can be laid down upon this subject, except that each region offers some peculiarity of its own.

Among the indications of mines, the first to be mentioned is the nature of the rock, or geological formation. We should not expect to find silver in granite, or tin in limestone; nor should we look for coal in granite or any other primitive formation—because it would be contrary to universal experience to find it in such a situation. Some indications are of a miscellaneous character; for instance, magnetic attraction is an indication of iron—bituminous stone of coal—and there are few copper ores which do not betray their existence by more or less of a greenish film. The study of the earthy or stony substances which accompany the ore in the lodes, is absolutely indispensable to the successful search after the mineral treasure. Of those which are usually associated with lead we shall presently speak. However little may be the value of these substances in themselves, they are of the first importance as indications of the near presence of what is valuable. On the side of any hill, for instance, formed of talk-shistus, or clay-slate, or the rock which forms the hill at Glen Osmond, the finding of fragments of ponderous spar, or even of crystallised calcareous spar, would induce a reasonable suspicion that lead ore was near at hand.

LEAD ORES.—Lead is found in nature in a variety of combinations; but, of all its ores, the only one of any practical importance is *galena*, in which the metal exists united with sulphur. From this, all the lead ore of commerce is extracted. Galena possesses such distinct external characters, that it cannot be easily mistaken, except for an exceedingly rare mineral, the seleniuret of lead. It is black, has a metallic lustre, and a crystalline structure, of which the elementary form is cubic, or in solid squares. It is perfectly brittle and very heavy. Galena containing silver cannot be distinguished by its external characters from pure galena.

Galena occurs among the oldest talk-shists and clay-slates. It is, however, more abundant among the transition rocks, where it is principally found in interrupted beds and masses. It is still more abundant in the blackish transition limestone, as in the mines of Durham, Cumberland, and Yorkshire, which alone furnish about one-third of the entire produce of Europe. These last, however, are not generally so rich in silver; in fact, the

places for adulterating white lead. It is reduced to the finest possible powder, and rendered white by boiling with very weak sulphuric acid. Carbonate of Baryta is distinguished from the sulphate by effervescing with muriatic acid. Carbonate of Strontia is of rare occurrence. Its solution in an acid communicates a beautiful red color to flame. 5. A red ore of iron is often found in the Hartz, above the most abundant deposits of lead and silver ore, of which it is supposed to be an indication. The Germans call it *iron hat*. Iron ore is, however, too plentiful to afford any real criterion, except under particular circumstances. 6. *Fluor* or *Derbyshire Spar*.—Extensively used for ornamental purposes, for the preparation of fluoric acid employed in corrodng glass, and as a flux for iron ores. It is harder than marble, but may be scratched with a knife; is semi-transparent, and often presents beautiful colors when polished. 7. *Sulphuret of Silver* appears to exist in a state of intimate mixture with the galena; when separate, it is black, easily cut with the knife, and not very brittle. 8. *Sulphuret of Zinc* bears some resemblance to galena, but is redder, and when dissolved in an acid, emits a smell of rotten eggs. 9. *Calamine* is a valuable ore of zinc which sometimes accompanies lead ores. It may be of various colors, but not dark. In Europe, it occurs chiefly in the carboniferous limestone, as in Derbyshire, and in magnesian limestone, as in the Mendip Hills. 10. *Sulphuret of Antimony* very frequently accompanies rich silver ores.

REDUCTION OF LEAD ORE.—After as much as possible of the matrix has been separated by the hammer, the ore is sorted by passing it through a wire sieve, of which the meshes are about an inch square. It is next washed to separate the adhering mud, by agitation in a tub of water, and then crushed into a coarse powder by means of a machine, usually worked by water, in which the ore passes first between pairs of fluted rollers, and afterwards between smooth ones. The stamping-mill is also used (though not invariably) either to reduce it into a fine powder, or to crush its matrix when consisting of substances like felspar, too hard to yield safely to the roller. Much pains are sometimes taken, by the mechanical operations of sifting and washing, to separate the powder of the pure ore from the earthy matter which accompanies it; but the necessity for this very much depends on the nature and fusibility of the matrix.

Galena consists of $86\frac{2}{3}$ of lead, combined with $13\frac{1}{3}$ of sulphur; and the object of smelting is to dissipate the sulphur, by exposure to heat, with access of air. Under these circumstances, the sulphur is, as might be supposed, not simply expelled by the heat, but a portion of the sulphur and lead in the first instance combine with the oxygen of the air, forming oxide and sulphate of lead. The sulphur of the remaining galena reacts upon the oxide, combining with its oxygen, and flying off as sulphurous acid gas, while the lead of both portions is left in a separate state. A certain quantity of sulphate and oxide of lead still exists in a state of

mixture with the earthy matter of the ore, and form what is called the *slag*; a quantity of quicklime is therefore added, which solidifies the slag, facilitates its separation, and at the same time converts the sulphate into oxide. The slag is afterwards submitted to a second heating, when it yields an additional quantity of metal of an inferior quality. These operations are best performed in what is called a reverberatory furnace.

If galena be exposed to a brisk red heat mixed with iron-filings, or pieces of old iron, the whole of the metal will be reduced; the iron at once combining with the sulphur, and liberating the lead. But this plan would be impracticable on the large scale. The same end may be attained by mixing the galena with a suitable iron-ore (oxide) and charcoal; and where the abundance of silver renders it desirable to avoid all loss in the product, this principle may be advantageously adopted.

The smelting of a ton of lead ore in England usually requires about 8 cwt. of coal. In the process with oxide of iron, as actually practised at Viconago, about 14 cubic feet of beechwood and 35 cwt. of charcoal to the ton of ore, are said to be consumed; but there is doubtless some mistake in these figures.

EXTRACTION OF SILVER.—The usual process of separating silver from the lead has hitherto consisted in keeping the metal melted at a red heat, exposed to a current of air from a pair of bellows playing over its surface. The lead progressively becomes oxidised, forming *litharge*, which is from time to time removed from the surface, until at length the pure silver alone remains. The operation requires to be finished in a bone-ash cupel. The litharge is either sold as such, or reduced again into lead, by heating it with charcoal. In this process, the average waste of lead amounts to about 7 per cent.; but the lead from the reduced litharge is purer, and fetches a higher price. In this process of extracting silver, as performed in the Hartz, a ton of lead is estimated to require the consumption of 150 cubic feet of wood fuel; but this, of course, greatly depends upon the nature and density of the wood.

Mr Pattington has introduced a very simple, but valuable improvement upon the old mode of proceeding. A large pot is filled with the lead containing silver, and immediately it is fully melted, the fire is removed. It is then allowed to cool as slowly as possible, and continually stirred, and especially at the sides of the pot, with a piece of iron. The lead gradually solidifies in the form of small crystals, which must be removed with an iron drainer as fast as they appear. These crystals consist of pure lead, and the whole of the silver remains in the still melted portion; the latter gradually becoming enriched by the abstraction of the former, until about nine-tenths of the lead are removed. The remainder is then ten times richer than before, and may, in a corresponding degree, be more advantageously operated upon by the ordinary process, the cost of fuel and the waste of lead being diminished in proportion.

From 1790 to 1802, the average annual quantity of silver produced by different countries was as follows; the New Continent producing twelve times more than the Old :—

	<i>lbs. avoird.</i>
Siberia	38,500
Hungary	44,000
Austria	11,000
Saxony	22,000
Norway	22,000
Sweden, France, and Spain	11,000
Central America	1,320,000
South America	605,000
Total	2,073,500

The following is a statement of the quantity of lead, including shot, white lead, &c., exported by Great Britain in 1833, to several countries :—

	<i>Tons.</i>
Russia	1,483
India and China	2,979
New South Wales, Van Diemen's Land, } and Swan River	} 223
Cape of Good Hope	85
United States	4,895
Brazil	404

E. D.

CHANGE.

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Yes, Change is Nature's law; as night and day,
 So joy and sorrow hold alternate sway—
 And life but guides the finger of decay.
 Christmas may come with merriment and cheer,
 And the red holly deck the waning year—
 Yet who would dare, with curious eye, to scan
 The scroll which marks the future fate of man?
 We live, we die, a few brief moments o'er,
 Silent we stand on the eternal shore,
 And life's poor pageantries deceive no more.
 Trust not this changing world—it is a screen
 Veiling from vision glories yet unseen;
 Trust not the world—but let each moment spring
 Upwards to Heaven, on Faith's untiring wing.
 So shall the Star of Bethlem rise on thee,
 And guide thee on through this Gethsemane;
 Till, Nature's struggle o'er, each conflict past,
 Eternal Christmas dawns on thee at last.