

XIV.—*On some remarkable Phænomena attending the Lodes of Polgooth Tin Mine.*

By JOHN HAWKINS, Esq. F.R.S. &c. &c.

MEMBER OF THE SOCIETY.

THE object which I have in view, in the following communication, is to point out to the notice of geologists, a case of rather unusual occurrence in the natural history of our mineral veins, the explanation of which will shew the practical importance of these enquiries.

I shall, therefore, confine myself to the statement of such phænomena as were either observed by myself, or were communicated to me in 1791, by the very intelligent director of the mine, Captain Phillips; in the hope that others, who may have the means of doing it, will supply that information which is here deficient; for it is probable that, as the mine continued

open some years after I visited it, the further extension of the works under-ground may have enabled the miners to ascertain many facts which were at that time undetermined, and to make other important discoveries.

And here I must express the regret which I feel, in common with so many others, that no records are preserved of all those natural phenomena which occur to the notice of our miners in the progress of their operations. I regret it not only on account of the loss which the science of geology sustains by its omission, but because I believe it has materially affected the stability of our whole mining system; for, if it be true, that old mines are often re-opened, in reliance on some vague traditional reports of their former productiveness, which generally prove fallacious; how desirable it would be to prevent all this waste of capital, and to reserve it for less hazardous speculations! There is, moreover, a great analogy between the phenomena of lodes in the same district, which serves to guide the miner in any new adventure; but how can he fully avail himself of this advantage without having recourse to some better authority? If we consider it in another point of view, the loss which science sustains by this omission, will appear to be incalculable; for the progress of our mining operations is of necessity so slow, that ages scarcely suffice to develop all the circumstances which characterize the mineral veins of a particular district,

and if these circumstances be not committed to writing as they occur, how seldom can they be accurately reported, and how often must they be wholly forgotten.

The importance therefore of recording these observations, must be admitted; and what a length of time is requisite in most instances to complete them, will be evident from the following account of Polgooth, which, although one of the oldest mines of the county, was not sufficiently explored in the year 1791, to enable me, or even the director of the mine, to decide upon some points of the greatest interest.

A few words, perhaps, may be necessary in this place, to justify the use which I have adopted of our provincial terms. I must observe then, that every mining country has a technical language of its own, which is more or less expressive, and for which it would be difficult to find an equivalent in the received idioms. The question then is simply this—shall we retain the use of this language, or attempt to explain ourselves, and at the best very imperfectly, in a language which is more generally understood? The patriotic views which were proposed by the institution of this Society, must, in my opinion, decide us to adopt the former of these alternatives; nor can there be a doubt, should a more general diffusion of mining ideas render it expedient, that these terms would soon cease to be provincial.

It is well known that Polgooth has been one

of the most productive mines in the county, and it will appear from what follows, to be no less interesting in a scientific point of view.

The country (to use the language of our miners) is composed of killas; the beds of which dip in an angle of about 20° to the W. S. W.

The principal lode here, which has been so productive of tin at different periods in the course of the last century, runs E. and W. by the compass, and has been traced to a very great extent in that direction. (See plate V.)

Its general underlie is to the north; the only exception to this being in a small space of ground west of the old engine, where, at the depth of ten fathoms from the surface, the lode underlies a little to the south, for the space of several fathoms in length, and a few in depth: the cause of which is attributed to some hard ground in the northern wall of the lode.

With respect to the degree of its underlie, as the lode is composed almost wholly of small veins which drop in, as it were, on both sides, the leader itself being so small that it frequently disappears, there is scarcely a possibility of ascertaining it with any degree of precision. It may be assumed, however, in a general way, at six inches in a fathom, and it amounts to twelve inches at the place where it meets the New Glands lode.

Its breadth upon the whole, is very inconsiderable, contracting frequently to six inches

and seldom exceeding twelve, but there is a spot near the Old Glands shaft and Burn's, where the lode is so much enlarged by the numerous branches that fall into it, as to amount to from ten to fourteen feet. It has been observed, that some of these branches strike out again in the space of a few fathoms, but others continue incorporated with the lode to a much greater extent. They are not inaptly called *feeders*, for they seldom fail to make good bunches of tin at the point of their coincidence.

The lode, or to speak with more precision, its leader, contains much spar (quartz) which here and there encloses tin, accompanied by peach (chlorite); but almost all the tin is found either composing the small fissures which run through the killas on the sides of the lode, or immediately in contact with the wall of the lode; in each case there is an abundant intermixture of peach, and often a small portion of yellow mundic. Even the killas itself is sometimes impregnated with tin on the sides of the fissures. It is the breadth of these fissures collectively, added to that of the spar leader, which is usually called here the bigness of the lode; although that term is sometimes confined to the single vein of ore which runs through the *caple*.

This lode, which, for the sake of distinction, is called Polgooth lode, intersects several others, which run in a north-west and south-

eastern direction, and have been very productive of tin.

The opposite parts of one of these intersected lodes, in consequence of a circumstance which once occasioned some doubt of their identity, have obtained two different names, the northern being called Polyer, the southern Screeds.

The direction of this intersected lode is N.N.W. and S.S.E. by the compass, and its underlie is east nearly four feet in a fathom.

The average breadth of Polyer is between six and seven feet, that of Screeds is from three feet and a half to four feet, and its substance, which is in general very solid, is composed of spar and peach. It is remarkable that some *horses of killas*, which are three or four fathoms in depth, and two or three feet in breadth, are found inclosed in this lode.

Screeds, or the southern division, has been heaved by Polgooth lode about fifteen feet to the right, or on the side of the greater angle, and, together with it, a lode of considerable size, which diverges from that point about twenty-two degrees to the eastward.

This lode is called St. Martyn's, and its corresponding portion is said to have been once explored at a spot called Phillis's Old Chear Shaft, where it is said to have exhibited such symptoms of poverty as to have discouraged all farther attempts to pursue it. There is, however, a general belief, or rather prejudice,

among the miners here, of its being incorporated with Polyer, although the difference in the direction of these two lodes warrants a contrary inference.

The direction of St. Martyn's is nearly N.W. and S.E. by the compass. It underlies nearly six feet in a fathom to the N.E. and its general breadth is about four feet, although in some places it amounts to twelve.

The contents of this lode are chiefly spar, mixed in some situations with tin and peach.

It has been observed in respect to Screeds and St. Martyn's lodes, that this tin is always found in the hard substance of the lode, and not in the adjoining killas.

Polgooth lode intersects another, the southern portion of which is called New Glands.

The direction of this lode is N.W. by N.: its underlie is one foot and a half in a fathom to the north, and its breadth is generally one foot and a half.

The northern portion of New Glands, which has likewise a different name from its corresponding half, has been tried principally at very shallow levels; where, in consequence, as it is supposed, of some very hard ground which composes the northern wall of Polgooth lode, it is split into small branches, which are in some places almost imperceptible. At the depth, however, of ninety-six fathoms, it exhibits its usual character. It is generally supposed to be heaved, like the preceding, by

Polgooth lode. On the other hand, there is a cross course near Burn's shaft, running north and south, and underlying about one foot and a half in a fathom to the west, which heaves Polgooth lode itself about one foot to the left. This course is said to be about ten inches in breadth, and it is composed of copper ore and mundic.

Southward of the New Glands is another lode, called Vanvean, which is distant in one spot as much as ninety fathoms from Polgooth lode, and points one degree of the compass towards it westward. The true direction, therefore, of Vanvean, is west by north by the compass. Its underlie is nearly the same as that of New Glands. Its general bigness may be estimated at one foot, and it is composed of spar and peach.

Both New Glands and Vanvean intersect and heave Screeds and St. Martyn's lodes.

At the distance of sixty fathoms farther to the south, and of one hundred and fifty fathoms from Polgooth lode, occurs a large course or quarry of elvan, which points with a still greater degree of inclination towards Polgooth lode as it proceeds westward.

This porphyritic dyke, as it may be called, which is known here simply by the name of elvan, has a very considerable underlie to the north (six feet in a fathom) and falls into Vanvean lode at the forty-eighth fathom level, in-

tersecting it horizontally after the manner of a slide, and occasioning a start.

Elvan has been traced to the depth of seventy-six fathoms under the adit, and it has a regular breadth of seven fathoms. In its progress eastward, it cuts sharply through Screeds lode, and heaves it fifteen feet on the side of the smaller angle.

If we follow the elvan still farther in the same direction, we shall come to the point of its intersection with St. Martyn's, where some phenomena occur, to which I must particularly direct the reader's attention. This point is at the distance of 320 fathoms from the spot, where Screeds and St. Martyn's are each intersected by Polgooth lode.

Here then at the forty-five fathoms level, both the Elvan and St. Martyn's lode are intersected by an upright flookan, which runs nearly in an angle of 30° to the direction of the former. The consequence of this has been a very considerable and complex heave on the left, or on the side of the smaller angle.

A plan of this remarkable heave, and of the relative situations of the separated lodes, which was communicated to me by one of the directors of the mine, is here inserted in the general drawing of the lodes. The distance from A to B is sixteen fathoms, and B is supposed to be the corresponding part of St. Martyn's lode. It is plain, however, that this cannot be

the case, because, although we have innumerable instances of lodes being intersected and heaved, there is not one of their being shifted, *i. e.* misplaced, as to the order of their succession, in the manner here supposed. For whether A had previously cut through F, or was itself intersected, its corresponding part would be found on the right of the Elvan, not on the left of it. In the former case it would be between C and D, in the latter at D. But the reasons for believing it to be at D, are, I think, conclusive, and they are as follow. We see that Screeds and St. Martyn's lodes are both intersected by New Glands and Vanvean, and again that Vanvean itself is intersected in its underlie by the elvan. The elvan, therefore, is of more recent formation than either of the four lodes here mentioned, and, accordingly, we see it passing through Screeds, and without doubt it would be seen to pass in the same manner through St. Martyn's, were it not for the interruption which it subsequently experienced from the flookan. Again, as the heave of Screeds lode was to the left, we must conclude that that of St. Martyn's lode was in the same direction, and consequently must look for its corresponding part at D, where, perhaps, it has by this time been discovered.

As for B, which, from the circumstance of its running in the same direction as St. Martyn's lode, has been mistaken for D; its correspond-

ing lode will be found on the north wall of the flookan, at the same distance from A eastward as it lies from E eastward. Lastly, the southern continuation of B is C. The continuation of Screeds in like manner must be looked for at G.

