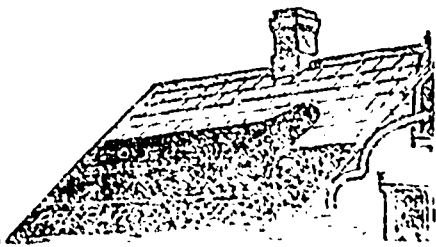


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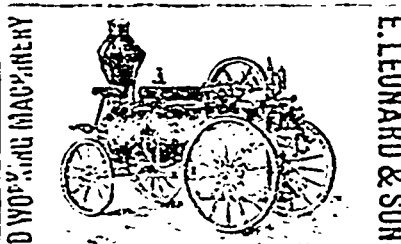
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MINING.

FAULTING IN VEINS.

Written for the Engineering and Mining Journal by S. F. Emmons.

(Concluded.)

Although under suitable conditions the most rigid rock masses may develop a certain amount of plasticity, the effects of movement and pressure will necessarily vary very much with the relatively rigid or plastic nature of the rock material and with the amount of displacement to which they have been subjected. The crushed material may under favorable conditions be drawn out into long attenuated sheet-like masses, or it may only be irregularly broken and squashed. In fault-fissures, which have become mineral veins, it is much more difficult to recognize the original character of the material in the fissure than in other fault-fissures, because they are those that for some reason or other have become favorite channels for the circulation of chemically acting solutions, and this material is therefore more widely charged from its original condition. Hence it often requires an eye specially trained in the observation of structural phenomena to correctly interpret the observed conditions. The features of certain veins, which Mr. Church cites in disproof of the fault origin of the fissures, are to the structural geologist so many direct proofs of such origin. It seems singular that, in the case where he makes the apt comparison of the quartz slabs to figs pressed in a box, it had not occurred to him to call in pressure to account for the phenomenon. Whether the material was quartz at the time the pressure was exerted seems doubtful. I have often seen quartz which had filled a narrow seam, either by infiltration or replacement, and had so perfectly preserved the striations on the clay walls of the fissure as to appear itself to have been striated; yet there was no doubt that the quartz had been deposited subsequently to the movement which produced the fissure. In one such case the mine foreman pointed to the superior quality and definition of this quartz wall as a reason why he had never cross-cut on that side of his vein. It was a fault fissure, in a somewhat altered eruptive rock of relatively plastic nature, which was so finely "sheeted" that where there were abundant walls, and clay selvages of exceptional definition and regularity, it was difficult to tell where mineralization ceased laterally, and the foreman not long after found his richest body on the other side of the wall he had so long regarded as the best defined limit of his vein.

Faults, like flexures and other deformations of the original rock masses which make up the earth's crust, are the result of dynamic movements within that crust. Such movements are accompaniments of orographic disturbances at different periods in the earth's history, which have been most frequent in mountainous regions; hence the older the rocks in which veins occur, the greater the number of dynamic disturbances they are liable to have been subjected to. Each disturbance by no means necessarily produces new fracture or faults; it may result in further compression, or in a deformation in the nature of flexure. Further compression might produce some differential movement in the already broken parts of a vein, and this movement would be more readily effected on easily lubricated surfaces like clay selvages, or it might simply produce, what I have called for want of a better term ready at hand, intermolecular movement: that is, a slight relative displacement of small particles within a given mass without a movement of the mass itself in relation to adjoining masses.

An instance in point which occurs to me is the anthracite bed near Crested Butte, which lies nearly horizontally and is but slightly faulted, and yet the coal breaks readily into small irregular fragments, all of whose surfaces, many of which are curved, bear evidence of compression in direction and polish. The bed as a whole has evidently been intensely compressed, and yet only intermolecularly deformed.

As an instance of apparent flexure, I have in mind a great silver vein (the Bluebird, of Butte, Mont.) in granite, which has been so deformed that its line of dip has in certain parts of its course an S curve. When a new lower level (100 ft below the previous one) was run to strike it at the commencement of this curve, it was not found on its normal dip, but by crossing it was recovered 240 feet away in the hanging wall, going down at its normal angle. At first it was supposed to have been faulted, but in tracing it back above the cross-cut it was found to run up 50 ft. above the level, then descend gradually toward the foot wall, nearly down to the level of the drift, and curve up again in normal position a few feet above where it had been looked for. In all this distance the vein matter was continuous, but drawn out and attenuated, as coal seams are often found to be in abrupt flexures.

The subject of fault phenomena, which interests me extremely, can hardly be adequately discussed within the limits of a newspaper article; but I fear I have already unduly trespassed on your time and space, and will therefore close by saying that on geological grounds, some of which I have touched upon above, I think we are hardly justified in assuming, *a priori*, that a vein is likely to be more regular on its dip than on its strike.

U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.

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