XXV. On the action of steam and quick-lime upon heated galena

Mr. H.L. Pattinson

To cite this article: Mr. H.L. Pattinson (1829) XXV. On the action of steam and quick-lime upon heated galena , Philosophical Magazine Series 2, 5:27, 172-174, DOI: [10.1080/14786442908674955](https://doi.org/10.1080/14786442908674955)

To link to this article: <http://dx.doi.org/10.1080/14786442908674955>

Published online: 14 Jul 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

when the excitation is very good, the spark is much longer. This glass, as Dr. Priestley observed, is more powerfully excited than the finer sorts, and its power is but little affected by a moist atmosphere.

XXV. *On the Action of Steam and Quick-lime upon heated Galena.* By Mr. H. L. PATTINSON, Alston, Cumberland.

To the Editors of the Philosophical Magazine and Annals.

Gentlemen,

PERHAPS nothing has contributed more to the great advancement of knowledge within the last few years, than the rapid exchange and diffusion of information among scientific and practical men by means of periodical publications. Opportunities are offered of putting facts upon record without difficulty or delay; and although some communications may possess a greater degree of interest than others, yet there is probably no one in which well-ascertained facts are correctly stated, which remains without its use at some period or other. I am induced by these considerations to send you an account of two experiments which I lately made on the reduction of galena.

Experiment 1.—An earthen tube 18 inches long and $\frac{3}{4}$ ths of an inch internal diameter was properly coated, and made to traverse a furnace in which ten inches of the middle could be highly heated. To one end was attached a bent tube terminating in a pneumatic trough, and to the other a retort containing water made to boil by the flame of a lamp. One thousand grains of very pure cubical galena were wrapped up in a cylinder of paper, and pushed to the middle of the tube when very hot; and over this was transmitted a current of steam. A copious stream of sulphuretted hydrogen gas was emitted, and the water in the pneumatic trough became as white as milk, before the operation was concluded: no precipitate was deposited from this water after standing twenty-four hours, it was still milky and turbid. The process was continued an hour; and during the whole time gas of the same kind was given off, but slowly towards the conclusion.

On breaking the tube after cooling, it exhibited the following appearances.

a. A cake of fused and partly reduced galena, flat on the upper surface, and having the form of the tube below, occupied three inches of the tube nearest the retort from which the steam issued. This mass was brittle; it could be cut with a knife, but not a particle of metallic lead was observable. This substance was most probably a sub-sulphuret of lead.

b. Six

b. Six inches of the middle of the tube was quite empty, excepting a small number of brilliant cubical crystals, which seemed to be a portion of sublimed galena.

c. Three inches of the end of the tube connected with the trough was nearly filled with sublimed galena, beautifully crystallized in cubes of considerable size, and having a very splendid appearance. These crystals broke again into other cubical fragments having very brilliant faces, and in this respect exactly resembled the original ore before being subjected to heat. A small quantity of ore was deposited in the coldest part of the tube, near the end projecting from the furnace, in the form of a fine blueish-gray powder without cohesion. Not a particle of true metallic lead was produced by the operation.

Experiment 2.—Another tube was coated and arranged exactly as in the last experiment. Nine inches of the portion nearest the trough were filled with pieces of recently burnt lime, each about the size of a pea; and when heated to whiteness, 600 grains of galena were introduced into the end of the tube to which the retort was attached; and after being sufficiently heated, it was carried through the highly incandescent lime in the state of vapour, by a current of steam. During the process a large quantity of sulphuretted hydrogen gas was given off, but the water in the trough never became so milky as in the last experiment.

On opening the tube at the end of the operation its appearance was as below.

d. All the galena was expelled from the end into which it was introduced, no portion whatever remaining.

e. The lime in the middle of the tube exhibited the same appearance as when introduced, excepting one or two pieces which had acquired a yellow colour on the surface; but this yellow colour did not penetrate to any depth; and if occasioned by the formation of sulphuret of lime, its quantity must have been very inconsiderable.

f. A few pieces of lime towards the end of the tube had apparently imbibed a portion of galena; as they had acquired weight considerably, and exhibited a steel-grained fracture when broken. The colour of these pieces on the outside was a fine dark indigo blue.

g. Towards the extremity of the heated part of the tube, a quantity of the ore operated upon was deposited in a crystalline form as before; but its colour was externally a very dark indigo blue, differing in this respect from that deposited in the first experiment.

h. A quantity of ore was found in the form of a grayish black powder as before, near the end of the tube.

i. Some

i. Some small drops of fused ore, which very much resembled the imperfectly reduced ore of *a* in the first experiment, occupied the bottom of the tube immediately at the end of the lime; but there was not a particle of pure lead formed in any part of the tube.

k. Four hundred grains of the gray-coloured lumps described in paragraph *f*, were assayed with borax and tartar; and a button of lead weighing 138 grains was obtained. From this lead a small globule of silver weighing $\frac{22}{1000}$ th grains was extracted by cupellation, which is after the rate of 13 oz. 3 dwts. 10 grs. per 21 cwt. avoidupois of lead, and is not more than might be expected from the sample of galena submitted to experiment.

From these experiments it appears, 1st, that the vapour of water is decomposed by transmission over heated galena, its hydrogen uniting with a portion of the sulphur to form sulphuretted hydrogen gas, and its oxygen combining with the equivalent quantity of galena to form sulphate of lead, to which the milkiness of the water in the two experiments is to be attributed. The galena, which gives up a portion of its sulphur to form sulphuretted hydrogen gas, is probably reduced to the state of sub-sulphuret of lead. 2ndly, Quick-lime is used in the large way to reduce the slags or scoriæ from lead ore into a pasty state, so that they can be more easily removed from the hearth or furnace; but it appears to have a very inconsiderable effect in promoting the reduction of galena; and hence the quantity used should be no more than may be sufficient to effect the purpose for which it is applied. 3rdly, The deposition of galena from its vapour in contact with steam in a highly crystalline form is an interesting circumstance. The crystals exactly resembled in appearance many specimens from the numerous lead-ore veins traversing the mountain limestone of this district, and might warrant at least the conjecture, that galena in these veins has been in some instances supplied by sublimation from below. I am, Gentlemen, yours, &c.

Lowleyer-Alston, Jan. 13, 1829.

H. L. PATTINSON.

XXVI. *On the Curvature of Spirit-Levels.* By J. NIXON, Esq.

To the Editors of the *Philosophical Magazine and Annals.*

Gentlemen,

SOME years ago I received from Mr. Dollond four ground spirit-levels (unmounted), of which two served to replace the much less sensible original levels of the horizon-sector alluded to in *Phil. Mag. and Annals*, vol. iii. page 190. The tubes