XII. Observations on the magnetic property of cobalt and nickel. Extracted from a memoir read in the French National Institute

B.G. Sage

To cite this article: B.G. Sage (1802) XII. Observations on the magnetic property of cobalt and nickel. Extracted from a memoir read in the French National Institute , Philosophical Magazine Series 1, 13:49, 58-59, DOI: [10.1080/14786440208676091](https://doi.org/10.1080/14786440208676091)

To link to this article: <http://dx.doi.org/10.1080/14786440208676091>

Published online: 18 May 2009.

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

Article views: 3

View related articles [↗](#)

XII. *Observations on the Magnetic Property of Cobalt and Nickel. Extracted from a Memoir read in the French National Institute by B. G. SAGE, Director of the first School of Mines*.*

HAVING resolved to repeat the experiments by which Klaproth, Tassaert, and Haüy determined that cobalt and nickel are susceptible of acquiring magnetic properties, I proceeded to refine these semi-metallic substances by means which I shall here describe, and by which I extracted from cobalt the arsenic, iron, bismuth, and silver; substances with which it is almost always combined.

Having disengaged the arsenic, by torrefaction, from cobalt ore of a whitish gray colour, I mixed pounded charcoal with the oxide or brownish calx which remained in the test. I then torrefied it a second time, in order to disengage the arsenical acid.

I then mixed this oxide of cobalt with two parts of vitreous flux† and a little pulverized charcoal. I fused this mixture, and obtained a button of cobalt, which I again fused with borax: after these two fusions the cobalt exhibited a homogeneous grain, though it contained iron, bismuth‡, and particularly silver, in the ratio of nearly a fourth.

I pulverized this cobalt, and, having mixed it with an equal part of sal-ammoniac, subjected it to distillation: caustic volatile alkali was disengaged, and there was afterwards sublimed in the neck of the retort sal-ammoniac coloured yellow by a little iron. The next sublimated portion had a pale green tint, a colour which arose from the cobalt. The retort having been kept in a red heat for an hour, salt or muriate of bismuth was sublimated in white foliaceous crystals. This salt, when put into distilled water, was decomposed, and rendered it milky.

I mixed the muriate of cobalt which remained in the retort with sal-ammoniac, and proceeded to distillation: the sal-ammoniac, which was sublimated, contained neither iron nor muriate of bismuth, and was coloured of a delicate green by a little cobalt.

I fused the salt or muriate of cobalt which remained in the retort with equal parts of black flux and a fiftieth of pulverized charcoal: in this alkaline flux I found the cobalt

* From the *Journal de Physique*, Floreal, an. 10.

† Composed of equal parts of white glass and fixed alkali.

‡ If this metal be in the ratio of a third, it diffuses itself around the button of cobalt, and incloses it as if it were set in it.

and

and silver in contact with each other, but without adhesion*.

It was this purified cobalt which I employed to discover whether it was susceptible of acquiring polarity by the magnet; and to ascertain it fully, I begged our colleague Coulomb, who is so familiar with these experiments, to have the goodness to assist me. I carried to him the ingots of purified cobalt and nickel, which he endeavoured to magnetize; but, as they did not indicate any magnetic property in a satisfactory manner, he desired me to fuse them into thin plates, which I accordingly did. They were then easily magnetized, and, being suspended merely by a silk thread, indicated the poles in a perfect manner. These facts prove that these two semi-metallic substances have, as well as iron, the faculty of retaining the magnetic fluid introduced into their pores.

XIII. *Experiments and Observations on the Heat and Cold produced by the mechanical Condensation and Rarefaction of Air.* By JOHN DALTON†.

IF a thermometer be inclosed in a receiver and the air suddenly condensed, the thermometer rises a few degrees above the temperature of the atmosphere; and if the air be exhausted from a receiver inclosing a thermometer, the mercury sinks a few degrees immediately; but in both cases after some time it resumes its former station. These facts are well known to philosophers of the present age, but they do not all agree in the explanation of them. Thinking the subject worthy of elucidation, I was induced to institute a series of experiments for the purpose, which I apprehend have led to a clear demonstration of the cause of the phenomena, and moreover make the facts themselves appear in a somewhat different point of view from what they are seen in at the first moment.

One circumstance is very remarkable, that whether the mercury rises or falls in these instances, it is done very rapidly; whereas in the open air, if a thermometer be only two or three degrees above or below the temperature, it moves very slowly. This seems to have suggested to every one the idea that the elasticity of the glass bulb of the thermometer has a principal share in producing the effect, by

* I purified the nickel from the iron it contained by sublimation with sal-ammoniac, and reduced it by fusing it with black flux.

† From the *Manchester Memoirs*, vol. v. part 2.

causing