*May 6, 1842*

## "RECORD OF EXPERIMENTS"[1]

*Henry Papers, Smithsonian Archives*

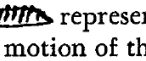
May 6th 1842

(Induction from Ordinary Electricity)[2]

Magnetize steelplate when straight then bend it into a [?smal] cylindrical form, note the effect

Also magnetize a plate while kept by means of a clamp in a bent condition. Note the effect when the plate is suffered to return to its flat form. In these experiments use iron filings

Make experiments on the slow evaporation of water on heated metal. I found a few mornings ago whiel I was heating water to shave, with a cup on the top of a sheet iron stove, that a drop of the size of a ½ cent would remain perhaps 10 minutes. When the drop was of this size I could plainly perceive that in its centre underneath there was a globule of steam and this globule remained under the water until the drop was diminished to the eight of an inch in diameter. This was evident by watching the gradual and slow diminution of the size of the drop and the appearance of the reflected light from its surface.

A section of the drop was of this form  . The part shaded thus  represents the steam.

The motion of the drop appeard to be due to the escape of the bubble of steam. As it bust out on one side the bubble was elongated in the direction of the diameter, pasing through the point of rupture and immediatly after the attraction of cohesion would tend to bring the bubble back into its circular form but the moment[um] of the particles would carry them

[1] This entry inaugurated a month-and-a-half period of intensive experimentation. Henry made short investigations of some subjects: patterns of magnetization and the mode of evaporation of water (May 6); formation and screening of secondary and tertiary currents induced by static discharge (May 6–7); capillarity and the daguerreotype process (May 13). Most of the research went into determining the direction of currents in wire (May 7 and following), in light of the recurring problem of reconciling his results with Faraday's ("Contributions IV: Electro-Dynamic Induction," Section II) and with Savary's observations of the effect of distance and strength of discharge on magnetization ("Contributions III: Electro-Dynamic Induction," paragraph 134, and "Contributions V: Induction from Ordinary Electricity; Oscillatory Discharge"). Henry looked at the way of measuring the direction of the current—the magnetization of a needle in a small spiral. In the most important work of the early entries, he showed that the magnetization was very sensitive to small changes in the experimental set-up (May 9–10) and spent much of the remaining period working on this observation. One result of this work was "Contributions V: Induction from Ordinary Electricity; Oscillatory Discharge," a June 17 oral presentation to the American Philosophical Society, never published in full form.

[2] A heading moved from the third page of the entry, also repeated on the fourth page, referring to the experiments done after his observations on magnetized steel plates and evaporating water. In the text there is a large blank space between these first subjects and his induction experiments, which lead off a new page.

beyond the point of equilibrium and elongulate the bubble in another direction. I found that by putting a brass pin into the bubble the steam did not escape, so that the temperature of the buble may be ascertained by plunging into it the ends of the thermo-galvanometer. To determine the effect of letting off the bubble of steam a small tube of glass may be plunged into the bubble—perhaps this would permit the steam to escape as through a chimney. Also by means of two platinum wires attached to the galvanometer perhaps a current of galvanism might be detected between the stove and the water of the bubble.[3]

Charged[4] the Franklin battery of 24 jars with 100 sparks of Haris unit measurer ball at the 7th ring on the stem. The ribbon coil No 2 was then placed on the coil with its <*strands*> spires seperated so as to ensure insulation. <*With*> Helix no 1 was placed in this and when the discharge was made *sam* felt a sever shock up to his sholders. This is the repetition with more precision of an experiment described in my 3rd series.[5]

Repeated this experiment with the variation of placing two persons in the circuit. The shock was again very severe, the smaller person Mr—[6] felt the shock very severely and both complained of its intensity.

Repeated the same again with the strands of the spiral farther apart and also with the circle of greater diameter. The shock was now not as severe as before but still unpleasant

To be more certain of the insulation, I placed the helix within a glass cylinder and the coil around this. The shock was now not as severe as before but still felt in the arms

Repeated again arrangement as before charge *125 spark*—shock more severe felt higher up on the fore arm.

Again *charge 150 sparks* from Haris' unit jar. The shock was still more intense felt <*in*> up the arms higher

Same arrangement continued with the variation of elevating the plane of the middle of the <*coil*> helix about 2 inches above the plane of the mid-

[3] Henry would pick up on this phenomenon again in experiments of October 1842 on steam. But his thoughts here probably led to the June 1842 addendum to the "Record of Experiments" entry for May 14, 1840. *Henry Papers*, *4*:384.

[4] Immediately above this line, Henry squeezed in the comment, "I here commenced a long series of experiments on the induction from ordinary electricity," outlined it in ink, and placed a footnote to it, "On this subject see exp. page 108," referring to the beginning of the entry for May 20, 1840 (*Henry Papers*, *4*:395–396). See also note 2 above.

[5] See "Contributions III: Electro-Dynamic Induction," especially Section VI, paragraph 112.

[6] Henry supplied a dash instead of the surname.

dle of the coil. Effect nearly as strong as the last shock, although the charge was but 100 sparks.

Same arrangement as the last—no effect. The only difference apparently between the circumstances of this and the last experiment was that the handles were grasped by myself and I stood on a chair. Tried the same again with the change of standing on the floor, instead of the chair, now I felt the shock in my arms but not severe.

Lowered the helix to the plane of the coil. Charge 100 snaps or sparks from the unit jar. Felt the shock in both wrists. There appeared in this experiment no cause of error shuch as cutting across of the charge &c.

Substituted for the battery 2 gallon jars with the charge of 25 sparks shock perceptible while standing on the chair

The experiments of this afternoon prove the truth of the account I gave in my 3rd series. A shock from the induced current can be obtained by ordinary electricity as well as from galvanism.

From some considerations of a hypothetical nature I had been lead to think that perhaps some error existed in the account I had published. In making the experiments <*as published*> which were published I had but few conveniences, the apparatus was the small machine and a single large jar sometimes the battery belong to the *Nairn* apparatus[7]

[7] Probably the electrostatic apparatus invented by Edward Nairne (1726–1806, *DNB*) around 1772. The large device consisted of a horizontal glass cylinder brushed by a collecting pad and powered by a hand crank, all placed in a solid mahogany frame. The machine was popular in England. Maurice Daumas, *Scientific Instrument Makers of the Seventeenth and Eighteenth Centuries*, trans. Mary Holbrook (New York, 1972), pp. 220, 240–241. See I. Bernard Cohen, *Some Early Tools of American Science* (Cambridge, Massachusetts, 1950), Appendix III, plate 13 and p. 160, for a similar form of apparatus. The glass cylinder from the Nairne machine formed part of the experimental set-up in figure eleven of "Contributions III."

## "RECORD OF EXPERIMENTS"

*Henry Papers, Smithsonian Archives*

May 7th Saturday 1842

(Induction from ordinary Elect)

Placed helix no 1 within glass receiver and around this passed a single spire of <*the*> copper ribbon. With the 2 jars and about 25 sparks the shock was almost imperceptible. The long coil was next added to the circuit but not so as to act on the helix—the shock was now imperceptible