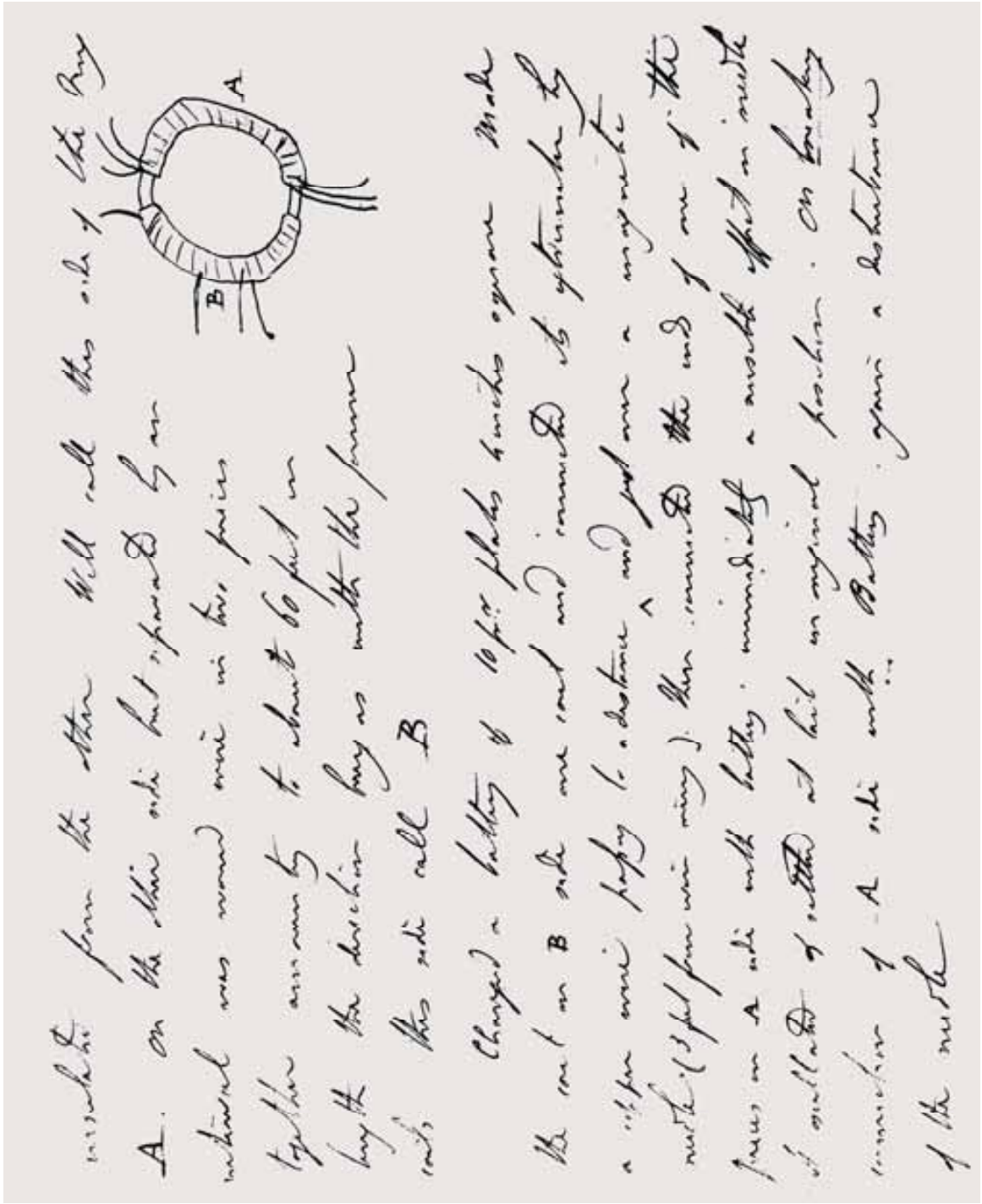
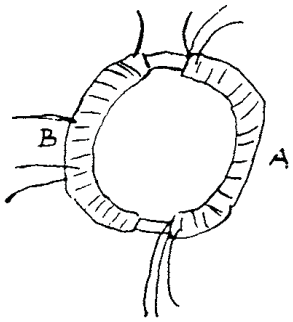



The entry recording the first successful experiment in electro-magnetic induction. August 29, 1831 (*slightly reduced*)

**1.** Expts. on the production of Electricity from Magnetism, etc. etc.

**2.** Have had an iron ring made (soft iron), iron round and 7/8 inches thick and ring 6 inches in external diameter. Wound many coils of copper wire round one half, the coils being separated by twine and calico—there were 3 lengths of wire each about 24 feet long and they could be connected as one length or used as separate lengths. By trial with a trough each was insulated from the other. Will call this side of the ring A. On the other side but separated by an interval was wound wire in two pieces together amounting to about 60 feet in length, the direction being as with the former coils; this side call B.

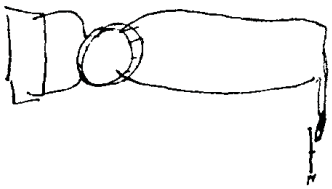



**3.** Charged a battery of 10 pr. plates 4 inches square. Made the coil on B side one coil and connected its extremities by a copper wire passing to a distance and just over a magnetic needle (3 feet from iron ring). Then connected the ends of one of the pieces on A side with battery; immediately a sensible effect on needle. It oscillated and settled at last in original position. On *breaking* connection of A side with Battery again a disturbance of the needle.

**4.** Made all the wires on A side one coil and sent current from battery through the whole. Effect on needle much stronger than before.

**5.** The effect on the needle then but a very small part of that which the wire communicating directly with the battery could produce.

**6.** Changed the simple wire from B side for one carrying a flat helix and put the helix in the plane of the Mag. Meridian to the west of the S pole of the needle, so as to shew best its influence when a current passed through it—the helix and needle were about 3 feet from the iron ring and the ring about a foot from the battery.



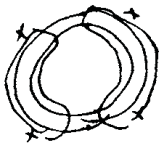
**7.** When all was ready, the moment the battery was communicated with both ends of wire at A side, the helix strongly *attracted* the needle; after a few vibrations it came to a state of rest in its original and natural position; and then on *breaking* the battery connection the needle was as strongly *repelled,* and after a few oscillations came to rest in the same place as before.

**8.** Hence effect evident but transient; but its recurrence on breaking the connection shews an equilibrium somewhere that must be capable of being rendered more distinct.

**9.** The direction of the pole towards the helix was, when the contact was first made, as if the helix round B was a part of that at A, i.e. the electric currents in both were in the same direction; but when the contact with the battery was broken the motion of the needle was as if a current in the opposite direction existed for a moment.

**10.** Had a short cylinder of irons 7/8 thick, 4 inches long, and coiled round with 4 pieces of wire each about 14 feet long: made these coils into one and substituted this in place of the flat helix. The needle was affected as before, but not at all as if the iron had helped to develope magnetic power—not more than helices round it would probably have done without the iron. It was the same transient and inverted states as before.

**11.** Removed the iron and helices and substituted two platina poles to ends of B coil; put these into solution of copper, lead, etc. etc., but could get no evidence of chemical action. Put solution of copper on to one pole and then touched the drop with the other; then connected the battery, then broke connection at drop, and then at battery, and so went on in succession so as to avoid the recurrence of the return or opposite current on the drop: but got no evidence of chemical action.



**12.** On making *all* the wire round the iron ring one helix and sending current from battery through it, and also hanging a magnetic needle over the ring, one pole being in the middle at the point of suspension, the needle darted about irregularly and shewed poles—two N and two S. On putting paper over the ring and sprinkling filings over it also see the 4 poles, but were irregularly placed. Iron probably not soft but evidently not a perfect conductor, for the parts between the ends of the two general helices of A and B were of very different magnetic power to the ends of the helices.

**13.** Put a helix (of brass brace spring) round a glass jar and brought a needle within it in various positions, but it behaved merely as a single ring of wire would have done.

**14.** Repeated (6): continued the contact of A side with battery but broke and closed alternately contact of B side with flat helix. No effect at such times on the needle—depends upon the change at battery side. Hence is no permanent or peculiar state of wire from B but effect due to a wave of electricity caused at moments of breaking and completing contacts at A side.

**15.** Tried to perceive a spark with charcoal at flat helix junction B side but could find none. Wave apparently very short and sudden. No use trying platina wire. Not sure large battery would not produce spark.

**15*a*.** Then disjoined the three portions of wire on A side—made two into one helix and sent battery current through that—and connected the third portion with the flat spiral and needle, etc. so as to represent B side. Effects on needle stronger than before but same in character, occurring inversely, etc. on breaking battery connection, etc. etc.

**16.** A large bar magnet brought in contact with the ring caused no change at the flat helix.

**17.** May not these transient effects be connected with causes of difference between power of metals in rest and in motion in Arago's expts.?

**18.** Took the iron cylinder (10) and connecting two of the wires into one Helix and the other two into another, connected one of these Helices with the flat spiral and needle and the other with the battery—immediately a sharp short pull upon the needle, the effects being exactly as before but not so strong. Hence a ring magnet is not wanted.

**19.** Brought the poles of strong magnets in contact with ends of the iron cylinder, but found no difference upon the needle at the flat spiral—all the effects seem due to the Electrical current only.

## SEPT. 12, 1831.

**20.** Have prepared several coils, helices, etc. etc. etc. Coil A consists of various lengths (as under) of copper wire, string being interposed between the turns of each coil and calico or linen between the different coils.

Coil B was composed of alternate copper and iron (see lengths