

IX. *An Account of some Electrical Experiments made before the ROYAL SOCIETY on Thursday the 16th of February 1737-8. By the Same.*

EXPERIMENT I.

TAB. I. Fig. I.

I Took the Glafs Tube *AB* of two Inches Diameter, which had at one End *A*, a Brass Ferril with a Brim cemented to it, and at the other End *B*, a Brass Cap close at Top, the Brass-work being join'd to it, in order to exhaust it of its Air upon Occasion. When this Tube was very dry, it would become electrical by rubbing, so as to snap by passing the Ends of the Fingers near it; but that Virtue could not be excited in the Tube nearer the Brass at the Ends than from *a* to *b*, and not unless the Tube was very dry within.

The Tube being thus prepar'd, and having an Ivory Ball *C*, of about two Inches Diameter, tied to it at the End *B* by a short String, I pass'd the Tube through the horizontally suspended Plate *DD*, till it was stopp'd by the Brim at *A*; and as it hung perpendicularly, the Ball *C* was within a Foot and an half of the Floor. The Plate *DD* was about 10 Inches in Diameter, and suspended by three small Cat-gut Strings as *E, e*, of about two Feet in Length, all which were tied together at *E*, to an hempen String hanging from the Cieling at *F*.

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By reason of the Distance of the Ends of the Cat-gut Strings close to the Plate at *eee*, I was able to thrust in between them one End of an open Tube *GG*, after I had rubb'd it so as to make it electrical, to see whether I could make the aforefaid suspended Tube *AB* the Conductor of Electricity to the Ball *C*; but the first Trial was in vain.

EXPERIMENT II.

Then laying horizontally over the Plate *DD* an Iron Bar a quarter of an Inch thick, and a Yard long, I hung at the Ends of it two Ivory Balls *cc*, of the same Size as *C*, by Packthreads of the same Length as the Tube *AB*.

Having again made the Tube *GG* electrical, I applied it over *A*, as before, and immediately the two Balls *cc* received the Electricity, so as to attract the *Thread of Trial T* hanging at the End of the Stick *ST*, when applied near them; though it received no Motion when applied to *C*. But if the Strings *Hc*, instead of Packthread, were Cat-gut, then the Balls *cc* received no Electricity from the Tube *GG* rubb'd and applied over *A*.

N. B. To be sure that the rubb'd Tube is made electrical, I pass my Fingers near it after rubbing, to hear whether it snaps; but always rub again before I apply it; because by snapping it loses its Electricity at the Place where it snaps.

EXPERIMENT III.

When I rubb'd the Tube *AB*, it would then attract the *Thread of Trial T* between *a* and *b*; but not at

all above *a* or below *b*, unless when I applied the Tube *GG* above *A*: Then the Thread of Trial would be attracted by the Plate *DD*, and the Top of the great Tube from *A* to *a*, but no lower. It would also be attracted by all the Bar *HH*, and only three or four Inches below *H*.

EXPERIMENT IV.

Having fill'd the Tube *AB* with Water, the Electricity of the rubb'd Tube *GG*, applied at *A*, ran strongly down the Tube *AB*, and impregnated the Ball *C*, so as to make it strongly attract the Thread of Trial, whilst the Balls *cc* received no Virtue at all. But upon wetting the Cat-gut Strings *Hc* with a Sponge, all the three Balls *cC* and *c* strongly receiv'd the electrical Virtue.

EXPERIMENT V.

I took away the Bar *HH*, and its Balls and Strings; and having well dried the Tube, I rubb'd it, and hung it up as before; so that it would snap, or attract the Thread from *a* to *b*, but no-where else.

Then putting the small Bar *HH* into the Middle of the Tube *AB* in its Axis represented by the prick'd Line, upon Application of the rubb'd Tube *GG* at *A*, the Virtue was immediately communicated to the Ball *C*. The same thing happen'd, when, instead of the Bar, a Brass Wire, a Walking-Cane, a small green Stick, or small Packthread, was placed in the Axis of the Tube.

EXPERIMENT VI.

I took a Barometer Tube empty, and very dry, and placed it in the Axis of the great Tube *AB*; but it would conduct no Electricity to the Ball *C*; though it carried it down very readily when full of Water, though quite dry on the Outside.

Another small Tube open at both Ends, which conducted no Virtue to *C* when dry, being only moisten'd a little by the Breath in blowing through it, carried down the Virtue from *A* to *C* very strongly.

N. B. All this while the Cat-gut Strings *Ee* received no electrical Virtue.

As I design to pursue these Inquiries much further, I beg Leave to be allow'd to make use of some Terms, (which I shall here define) in order to save using many Words in giving an Account of some electrical Experiments, which I have made, and shall hereafter make.

DEFINITION I.

A Body *electrical per se* is such a Body in which one may excite Electricity by Rubbing, Patting, Hammering, Melting, Warming, or any other Action on the Body itself, as Amber, Sealing-Wax, Glass, Resin, Sulphur, &c. besides many, if not all, Animal Substances.

DEFINITION II.

A *Non-electrical* is such a Body as cannot be made electrical by any Action upon the Body itself
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immediately; though it is capable of receiving that Virtue from an *Electrical per se*.

O B S E R V A T I O N S.

1. When the Air is full of moist Vapours, *Electricals per se* are excited to Electricity with very great Difficulty, requiring to be often warm'd, and much rubb'd; as appears in exciting that Virtue in Glass, Amber, Wax, &c.

2. In dry Weather, especially in frosty Weather, the *Electricals per se* will have their Virtue excited with very little Action upon them; as appears by warming a Glass Receiver, which, without any rubbing, will cause the Threads of a Down Feather, tied to an upright Skewer, to extend themselves as soon as it is put over the Feather. Sometimes Resin and Wax exert their Electricity by only being expos'd to the open Air.

3. *Electricals per se* retain the Virtue longest when kept near to, or inclos'd by, other *Electricals per se*. Thus the rubb'd Tube will retain its Virtue pretty long in dry Air, as appears by chasing a Feather about the Room very long without new rubbing; as also by Lumps of Resin and Sulphur, &c. which have been melted and poured into dry Drinking-glasses, keeping their Virtue long, if kept in those Glasses, and wrapp'd in dry Silk, or such sort of Paper as will become electrical by rubbing; for as often as they are expos'd to the Air, they will attract.

4. *Electricals per se* communicate their Virtue to any of the *Non-electrical*, when brought near them; in which Case the *Non-electricals* attract and repel like
like

like the *Electricals per se*. Thus an Iron Bar suspended by a silken Thread, an Hair Rope, or a dry Cat-gut, when an excited *Electric per se* is brought near it, will both attack and send out its *Effluvia* to a *Non-electric* held near it; as appears in the Dark by the Light coming out at the End of the Bar.

5. An *Electrical per se* loses its excited Virtue in communicating to the *Non-electrical*; and the sooner, the more of those Bodies are near it. Thus in moist Weather the rubb'd Tube holds its Virtue but a little while, because it acts upon the moist Vapours that float in the Air; and if the rubb'd Tube be applied to Leaf-Gold or Brass, laid upon a Stand, it will act upon it much longer, and more strongly, than if the same Quantity of Leaf-Gold is laid upon a Table, which has more *Non-electrical* Surface than the Stand.

6. When a *Non-electrical* is suspended by, or only touches an *Electrical per se*, it receives the Properties of an *Electrical per se* from a rubb'd Tube or Wax, &c. This appears by the Fire that flashes from the Fingers of a Man suspended by Hair-Ropes, or who stands upon a Cake of Resin, when he has receiv'd Virtue from the rubb'd Tube.

7. The Virtue which a *Non-electrical* receives from a rubb'd Tube, runs on to the most distant Part of the suspended Body from the Place where the Tube is applied, and seems to be collected there, from whence it flashes in the Dark, snaps, and exerts its Attraction upon the Thread of Trial; though as the Virtue runs along, it sometimes shews itself in other Parts of the suspended *Non-electrical*.

8. If a *Non-electrical*, whilst it is receiving the Virtue from the rubb'd Tube, be made to communicate with the Floor of the Room, or any other great *Non-electrical* Body by a *Non-electrical* String, how small soever, (though but a Thread) the Virtue will not shew itself, as it did before, at the Extremities, where the Flash of Light was seen.

9. If a *Non-electrical* be ever so big, when suspended, it will receive Electricity from the rubb'd Tube. And if five or six hundred Foot long, when the rubb'd Tube is applied at one End, the Bodies hanging at the other End will become electrical. This has been tried by several People as well as myself.

10. If a long *Non-electrical* String be fasten'd to an *Electrical per se*, and extended to a great Distance, being supported by *Electricals per se* to keep it from touching the Ground, all Bodies fasten'd at the End of it will become electrical when the rubb'd Tube is applied at the other End, though the Tube does not touch it, but is only brought within two or three Inches of it.

N. B. This String we have before called the *Conductor of Electricity*, and the Cat-gut or silken Strings, Glass Tubes, or whatever kept the long String from touching the Ground, *Supporters*.

If any of the *Supporters*, mention'd in the last Observation, be chang'd for a *Non-electrical* Supporter, the Virtue will there be stopp'd and taken away by that *Supporter*: But if that *Supporter* be again supported by *Electricals per se*, it will only receive so much Electricity as will impregnate it, and then the

Virtue

Virtue will go on to the End of the String, and impregnate the Bodies fasten'd to it.

12. The *Non-electricals* receive the greatest Virtue at the End of the String, and most of all, if they are wet. But the *Electricals per se*, if long Bodies, as long Sticks of Wax, and Glass Tubes, only become electrical at the End next to the String.

13. *Electricals per se* will become *Non-electricals*, if they be wet, or only moisten'd. Thus Supporters that transmit the Electricity immediately, stop it when wet with a Sponge, or when blown through, if open Tubes. And if the long *Electricals per se*, hanging at the End of the Conductor, be made wet, they will become *Non-electricals*, and strongly receptive of the Virtue given by the rubb'd Tube at the other End of the String.

N. B. All the six Experiments mention'd in the Beginning of this Paper, confirm this Observation.

14. A *Non-electrical* having been impregnated with Electricity by the rubb'd Tube, is repell'd by it, till it has lost its Electricity by communicating it to another *Non-electrical*. Then being in its first State, it is again attracted by the Tube, which holds it till it has fully impregnated it; then it repels it again. This is evident, by attracting a Down Feather by the Tube in the Air, and then repelling it; so as to make it dance backwards and forwards to and from a Finger held up at a Foot or two from the Tube. But the Thing appears more plainly from the following

E X P E R I M E N T VII.

Having rubb'd the Tube Tt , (see TAB. I. Fig. II.) and with it attracted a Feather, the Feather at t was repell'd from the Tube, whenever it was brought near it; but suddenly dipping the End T of the Tube in Water, the Feather floating in the Air came to it again, and stuck to the End of the Tube at T or near F .

N. B. In fair Weather this Experiment will not succeed, unless the Tube be thrust pretty deep into Water (a Foot at least); but in moist Weather an Inch or two will do.

P. S. Though animal Substances be generally thought to be *Electrical per se*, yet it is only when they are very dry: This is the Reason why a living Man suspended by a Hair Rope, or standing upon a Cake of Resin, to receive Electricity from the Tube, must be consider'd as a *Non-electrical*, by reason of the Fluids of his Body.

N. B. The above Observations, together with the *Queries* in my former Papers, will be further illustrated by some Experiments which I do not now mention, because I have only try'd them at home; but when I have try'd them before the ROYAL SOCIETY, I shall give an Account of them in Order.

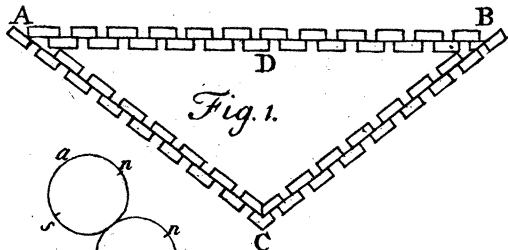


Fig. 1.

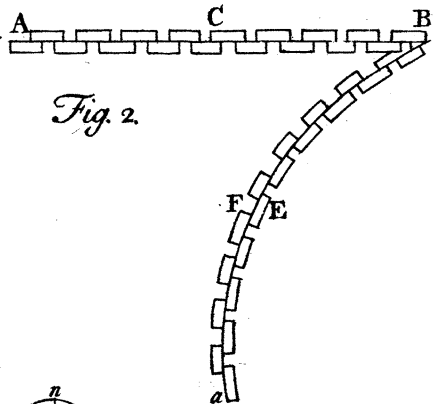


Fig. 2.

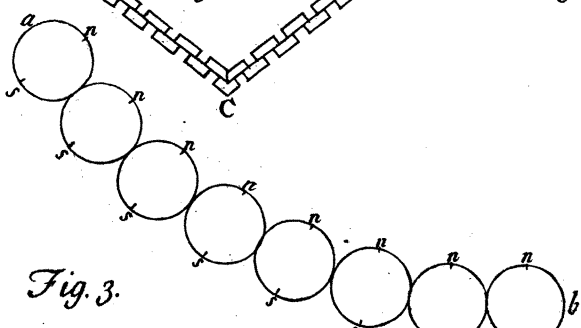


Fig. 3.

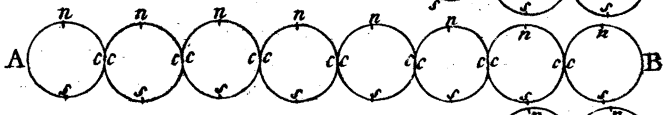


Fig. 4.

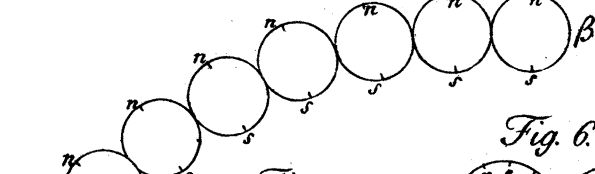


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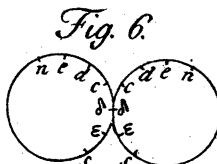


Fig. 6.

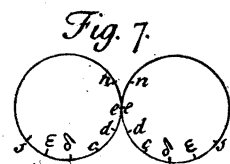


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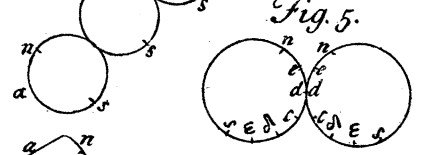


Fig. 8.

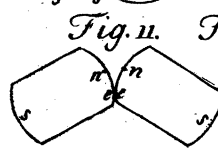


Fig. 9.

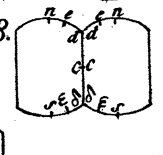


Fig. 10.

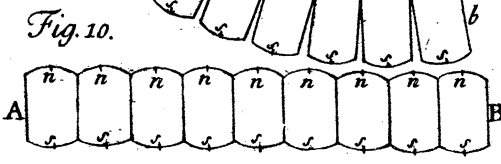


Fig. 11.

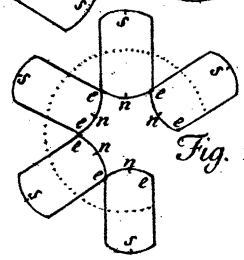


Fig. 12.

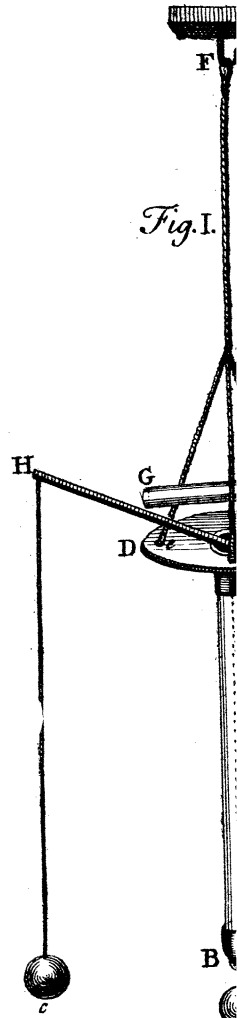


Fig. I.



Fig. B.

