

where at B. As you say the Amperean
force nearly produces a differential
pressure on the right & left sides
of the ^{cross} tube, which is negligible in
comparison. I will write and ask
Perry whether he has ^{yet} tried it.

Yours ever
Thomson

P.S. Don't you think it might be
possible to get a tension in the
electric arc by making it in a
strong field as at A above, i.e. making
it near the axis of a horizontal S. magnet
with some arrangement to prevent its being
blown outwards by the magnetic force? It
would be important to have a long straight vertical
circuit on each side to prevent Ampere forces
counting, there being all \perp to the current. But
the tension would be a few grammes, as on last
page.

24/9

ST JOHN'S COLLEGE,
CAMBRIDGE.

22. ii. 85

My dear Fitzgerald

I think you misunderstood.

My formula is that the part of the
kinetic energy of a volume element
of current $u \delta \tau, v \delta \tau, w \delta \tau$ which
involves the motion in the field is

$$u \delta \tau . F + v \delta \tau . G + w \delta \tau . H.$$

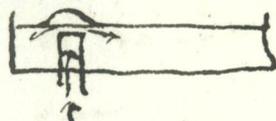
This belongs to the element in the
sense of the dynamical system, —
and still more clearly in the sense
of Ampere's electro-magnetic potential
energy with sign changed — just the
same way as the mutual potential
energy of attraction of the Sun & Earth
belongs to the Earth in finding the

specimens of ~~material~~ ^{force} of the latter. I know that I have put it all down too short, but if the tension reveals itself, I shall rewrite it with continuations. In fact the best detailed answer to your criticism will be to rewrite it, - once term is over, i.e. in 3 weeks. 24/9

Your other caveat as to the experiment had all occurred to me and been weighed. The divided circuit-idea I had not thought of, and it may prove useful for differential experiments later on.

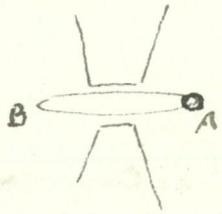
I have some reason to believe that my tension is actually involved in a very striking experiment of Sir H. Droy (Phil Trans. 1823) in which a current going up into a mercury trough keeps up the mercury

above the electrode;



while a magnetic pole placed below it flattens down the mercury again, & possibly when strong enough produces a vortex in it. But it requires careful analysis and perhaps looks as if the effect could not be separated from the electrodynamic forces of Ampere in this way.

On the other hand, using a tube to carry the mercury, & having



a field of say 1000 c.g.s. the appropriate electric force ^{at each point} round a circle of radius a when the field is made is $\frac{1000 \cdot 2\pi a^2}{2\pi a}$, or $\frac{1000a}{2}$, say $\frac{1000}{2}$. The mercury can carry say 1000 amperes per sq. cm. of section

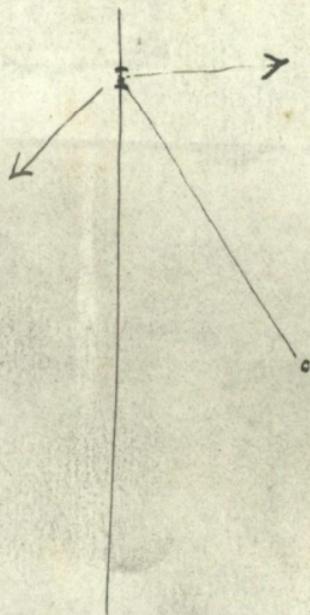
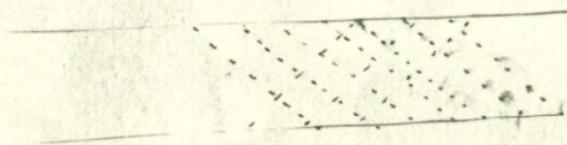
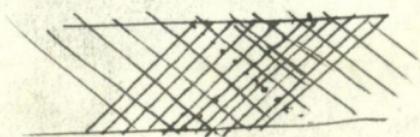
\therefore Tension in it = $\frac{1000}{2} \times 100 \text{ dynes} = 100 \text{ gr}$ per sq. cm.
= a column of mercury of **7** millim.

This will be + when the tube is at A, -

In the matter of the solvent I suppose a
bidecalon appears HCl formed in
which the HCl is strained in a definite
way owing to the configuration into
which the other constrains it, - and so
is finally pulled ^(by some accident) asunder, in this definite
way. This definite way we call H^+Cl^- ;
and it is conditioned by the mediation
of the solvent H_2O , otherwise H^-Cl^+
would be an equally likely way. The
ions are I suppose vortical, being formed of
rotating electrons, and thickening of
vortices, etc. may be involved in the
straining above mentioned, as you say.

That I think the above is a possible
answer to the question to which previously
I could see none.

24/9



24/9