two cases. (1) when the electricity producing the initial disturbance is inside the shell, in this case there is no propagation of energy outwards if the shell is a perfect conductor and the vibrations last for ever. (2) when the disturbing electricity was outside the shell in this case there is propagation of energy from the shell, in fact so much is propagated that after a few vibrations none remains in the shell.

I am going off to Cornwall for a walking tour but I expect to be back in Cambridge by the 22nd if you I shall be very glad if you write to me there

Believe me

Yours very truly

J. J. Thomson

Heaton Road
Withington
W. Manchester

3/1

Apl. 11/84

Dear Prof. Fitzgerald,

I am afraid I must have expressed myself badly in my last letter to you for I certainly never meant to say that the vortex ring and the surrounding ether moved like a rigid body. What I meant was that the vortex ring set the ether about it in motion (though the surrounding ether does not move so fast as the vortex) and that the momentum of all this moving fluid is proportional to the area of the vortex ring. If the vortex rings are equally distributed the mean velocity of the ether will be zero, but if more are moving in one direction than in any other the mean velocity of the ether will be in that

direction this velocity may be sufficient to reverse the motion of some of the slower rings, and these will have to move backwards. If Fizeau's result is taken to prove that in a gas none of the ether moves with the atoms then I must confess I do not see how to reconcile it with the vortex atom theory. I have lately been wondering whether after all the momentum we are concerned with is not the momentum of the rotationally moving fluid alone (i.e. the atom)? and that the momentum of the surrounding ether will not shew itself as pressure. For when I considered the pressure of a gas I supposed that there was no motion of the ether normal to the sides of the containing vessels. we do not know much about the ether but there seems nothing impossible in the supposition that though the atoms of the sides are at rest yet the ether can flow through the spaces between them, just as the wind flows through a lot of trees. If this were so the sides of the vessel would not stop the moving ether but only the moving atoms and the pressure then would be given by the same formula as the one in the ordinary Kinetic theory of gases. If we look at things in this way it is not necessary to suppose that the atoms are more dense than the ether and the theory becomes much more manageable. With regard to the point about considering e constant I do this in expressions like $\frac{1}{a}\log\frac{\delta a}{e}$. I do this because if I take the complete variation I have $-\frac{1}{a^2}\log\frac{\delta a}{e}\delta a + \frac{1}{a^2}\delta a - \frac{1}{a}\frac{\delta e}{e}$, now $\frac{\delta a}{a}$ & $\frac{\delta e}{e}$ are of the same order of small quantities and $\log\frac{\delta a}{e}$ is very large so that the first term is very large compared with the other two & these latter may therefore be neglected. The only other case when I consider e to be constant is in the expression we^2 which is known to remain constant throughout the motion. 3/1

With regard to the dissipation of energy in the electrical oscillations. there are