

»It has been definitely proved that we can receive signals from stations hundreds of miles away without any high receiving aerial, but merely by connecting one terminal of the receiving circuit to earth, and the other terminal to any large well-insulated mass of metal, whether inside or outside of a house does not matter«.

If I understand the difficulties so lucidly outlined by *Fleming*, they will be found to have proceeded from the inadequate theory of the aether heretofore in use, the discussion being based upon diffraction around the earth, instead of upon refraction and dispersion within the denser mass of the earth, and thus a bending of the wave front. This will sufficiently justify this quotation, since it is essential that the difficulties heretofore encountered should be authoritatively described. The reader can then judge as to whether a simpler and more practicable solution of this problem has been obtained.

As to the feebleness of wireless transmission by day, I have reached the settled conviction that it results from the magnetic wave field of the sun. When this storm of waves fills our air by day, the wireless waves have great difficulty in getting through, — just as any system of regular water waves in a lake, used for signalling across it, would be almost lost in distinctness, owing to the surface churning of the lake under the violence of a wind storm. The transmission is more difficult with the distance, and, after a certain distance, entirely fails. At night the sun's magnetic wave field is largely absent, and thus wireless transmission is much better.

It only remains to add that the celebrated argument of *Cauchy*, to the effect that refractive dispersion of light necessarily implies a granular structure in the transparent matter, is equally valid for showing that the aethereal medium itself is corpuscular. In his Popular Lectures and Addresses I, 190, Lord *Kelvin* has modified *Cauchy's* theory of refractive dispersion in his usual lucid manner. It is believed that the considerations adduced in this paper will render the arguments of both *Cauchy* and *Kelvin* somewhat more definite and interesting.

When the aetheron is so small, and moving so rapidly, the generation and propagation of waves in the aether is intelligible. The refractive dispersion, by the resistance to the waves from the much larger molecules of ordinary matter; is easily understood; and thus refractive dispersion implies in common matter, coarser granules than those of the medium itself, but yet points to the moving aetherons as easily deranged by the resistance of the waves dispersed.

It will be shown hereafter that resistance soon changes the form of the wave, and causes it to break up into two distinct parts, the larger having increased amplitude, and shorter length, hence encountering more resistance than the original wave. It is certain therefore that we not only have retardation in the propagation through the earth, but also dispersion of the fragmentary waves, and absorption of some of their energy as heat.

9. Outlines of the Wave-Theory of Magnetism, with explanation of the mechanism of Attraction and Repulsion.

For the sake of completeness the present investigation requires a brief notice of the cause of attraction and repulsion in magnets, and in electrodynamic action, as first outlined in the vol. 1, *Electrod. Wave-Theory of Phys. Forc.*, 1917. Accordingly we begin with magnetism, which the celebrated English physicist *Maxwell* had been so long engaged upon, but had failed to solve at the time of his death 40 years ago.

The accompanying figure from the work of 1917 will illustrate to the eye the essential character of a magnet, as conceived in the wave-theory of physical forces. A large magnet *A* is exhibited in the same field with two smaller magnets, *B*. In the first case unlike poles are presented, and we have mutual attraction. In the second case the poles presented are like, with the well known result of mutual repulsion. But how does this attraction and repulsion come about? What mechanism is involved, and in what medium does it work? Obviously the medium is the aether, because an electric current produces a magnet from a piece of steel wound in a solenoid, and because also the electrodynamic action of a current travels with the velocity of light, as was first inferred by *Maxwell*, and afterwards proved by experiment.

A) In the case of attraction, it will be seen that the waves from the small magnet *B* have the elements of the aether rotating in the opposite direction to the rotations in the more fully outlined waves from the magnet *A*. The plane waves from *A* are to be imagined, for the sake of simplicity, in the central plane, or equator, and travelling away with the velocity of light, — for the reason just assigned in electrodynamic action, by which magnets are produced.

As shown graphically by the curve traced just above the heavy waves in the figure, the amplitude of these receding waves decreases according to the law:

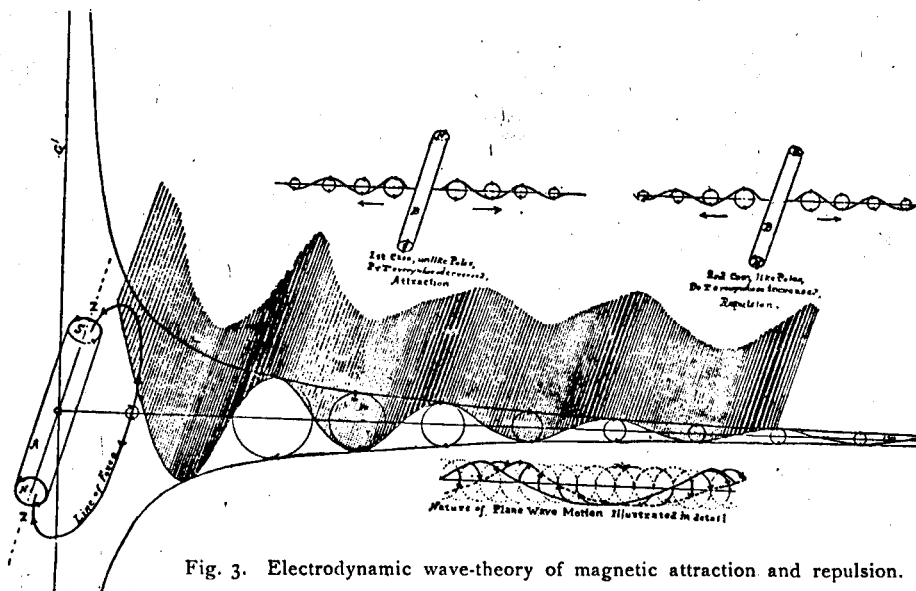


Fig. 3. Electrodynamic wave-theory of magnetic attraction and repulsion.