New Theory of Magnetism

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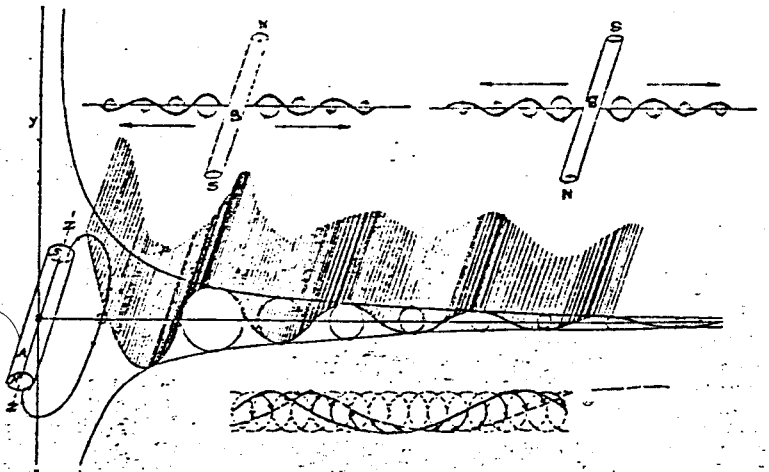
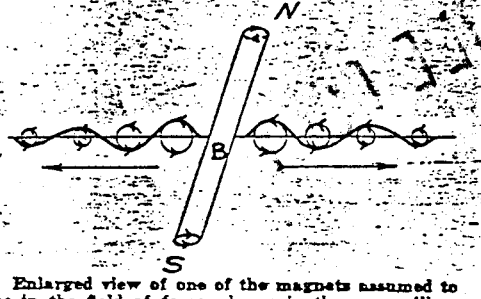
IT is scarcely necessary to point out to the readers of PRACTICAL ELECTRICS that although we have had many notable treatises on magnetism since the first great work published in the year 1600 by Dr. Gilbert, of Colchester, physician to Queen Elizabeth, yet in all these modern treatises not a single explanation worthy of the name has been offered on the *cause* of magnetism! The result is a great need for a working theory of magnetism which will enable us to see what is going on in the field about a magnet.

The theory herein set forth was developed by the writer in 1916, and first published in a work entitled *Electrodynamic Wave-Theory of Physical Forces*, Vol. I, 170 pages, Boston, London and Paris, 1917; but has recently been extended in a series of papers on the *New Theory of Æther* just appearing in the *Astronomische Nachrichten*, the international journal of astronomy at Kiel, which is now in its hundredth year and 212th volume. As the *New Theory of the Æther* is a very extensive work of highly mathematical character, we are obliged to restrict the discussion to very simple outlines which will convey clear ideas to our minds.



1. The magnetic field of force and its effect upon, and the reaction between it and magnets adjacent to it. Decreased attraction in the left hand magnet, and increased attraction in the right hand one.



Enlarged view of one of the magnets assumed to be in the field of force, shown in the upper illustration immediately above the field.

For a long time it has been known that all matter sends out a peculiar influence or *flux of energy*, which acts on other bodies; and ever since the publication of Sir Isaac Newton's *Principia*, 1687, it has been shown that all actions are mutual. Thus any influence exerted by one body on another will be based on the interactions of the two bodies, through the Etherial Medium enveloping both masses.

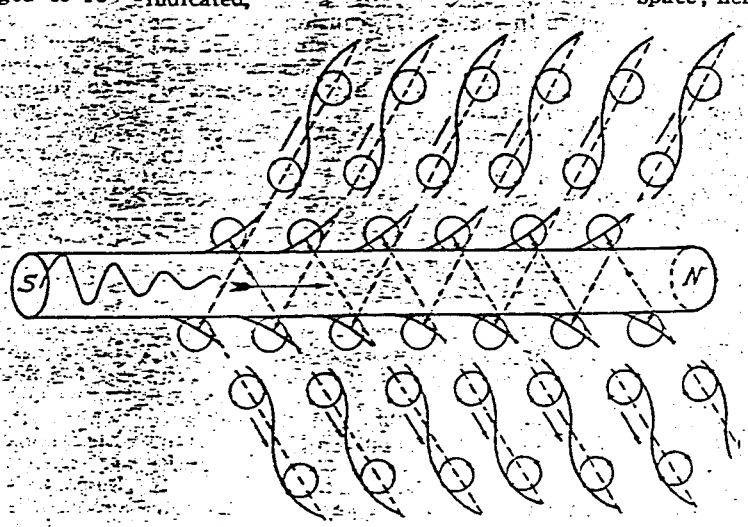
About 1850 it was discovered by the celebrated English electrician, Faraday, that all bodies are magnetic, but in varying degrees. Iron, steel and nickel are typical metals with strongly magnetic properties, and as far back as 1822 the celebrated French physicist, Ampère, explained magnetism by elementary electric currents circulating about the atoms. In the year 1917 the writer was able to show that this Ampère theory is identical with the modern wave-theory, in which the atoms are supposed to be vibrating and incessantly sending out waves through the surrounding aether.

When emitted violently the atoms [illegible]

and light. Accordingly, why may not these short waves correspond to parts of the longer waves of magnetism and of gravitation? Such was the question which has at length led to the very remarkable new theory of the ether, with simple and direct explanation of magnetism and electrodynamic action.

In the accompanying figure 1 we have outlined the body of a simple bar magnet, and also traced in detail the type of waves supposed to recede away from the magnet in the equatorial plane. It will be remembered that although the great mathematical physicist J. Clerk Maxwell was able to show that certain stresses are at work in the ether about a magnet, by which the lines of force tend to shorten themselves, he was unable to conceive of any physical cause for the action. Maxwell had not thought of waves of the type here imagined.

It is easily shown (cf. *Astron. Nachr.*, No. 5044, p. 54, May, 1920) that the *amplitude* of the waves follows the law here indicated,



2. The field of force surrounding a wire through which a current is passing, giving in diagram the effect upon the ether.

$$A = \frac{k}{r} \qquad (1)$$

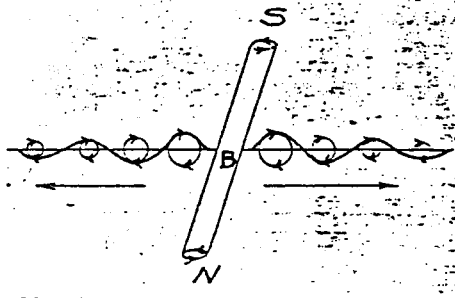
or varies inversely as the distance.

And it is proved in works on physics that the energy of the waves *is proportional to the square of the amplitude*, and thus the force they exert becomes simply:

This is the formula for gravitation, magnetism and similar forces which follow the law of the inverse squares.

Now it is very remarkable that the chief forces in nature vary inversely as the square of the distance. From this fact we know that if waves be the cause of the forces, the waves have to have amplitudes varying inversely as the distance, as shown in equation 1 above.

To deduce the law of the wave amplitude (1) in tridimensional space we proceed as follows: The displacement of any particle of a medium due to wave motion, of a given wave length, is independent of the periodic time; and since the oscillatory orbits of the particles are described in equal times, under continuous flow of the waves, these orbits will be proportional to the displacements or other homologous lines pertaining to the peri-



The other magnet on an enlarged scale, as shown to the right in the upper illustration.

odic paths of the particles. Let the velocities of the moving particles be v, and m their mass; then their kinetic energies will be represented by $1/2\ mv^2$. In the spherical expansion of the ether waves there will be no loss of energy in free space; hence on two successive sphere surfaces of thickness dr, the energies are equal, so that we have:

$$4\pi r^2 \cdot \tfrac{1}{2} m v^2 = 4\pi r'^2 \cdot \tfrac{1}{2} m v'^2 \qquad (3)$$

or

$$v^2 : v'^2 = r'^2 : r^2 \qquad (4)$$

The kinetic energy of the vibrating molecules varies inversely as the square of the distance. But the velocity varies also as the amplitude, in simple harmonic motion; therefore, for the amplitudes A' and A", corresponding to the radii r' and r", we have by taking the square root in equation (4)

$$A' : A'' = r'' : r' \qquad (5)$$

$$A' = \frac{A'r'}{r'} = \frac{k'}{r'} \qquad (6)$$

Accordingly the amplitude or side displacement becomes

$$A = \frac{k}{r} \qquad (7)$$

as shown in the accompanying figure 1.

To understand the mechanism of magnetism, imagine waves receding away from the larger magnet, as shown in the diagram, and let the smaller magnet (B) present opposite poles. This corresponds to the case of attraction. The waves from the small magnet (B) rotate in the oppo-