DAVIS'S MANUAL OF MAGNETISM: INCLUDING GALVANISM, MAGNETISM, ELECTRO-MAGNETISM, ELECTRO-DYNAMICS, MAGNETO-ELECTRICITY, AND THERMO-ELECTRICITY

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Trieste

CONTENTS.

INTRODUCTION.

Page
DEFINITIONS AND EXPLANATIONS,..... 1

PRODUCTION OF ELECTRICITY.

1. FRICTIONAL ELECTRICITY,..... 7
2. GALVANIC ELECTRICITY,..... 8
3. THERMO-ELECTRICITY,..... 67
4. ANIMAL ELECTRICITY,..... 82

MAGNETISM.

BOOK I.

DIRECTIVE TENDENCY OF THE MAGNET.

1. IN REFERENCE TO ANOTHER MAGNET,..... 89
2. IN REFERENCE TO A CURRENT OF ELECTRICITY,. 94
3. IN REFERENCE TO THE EARTH,.....130

BOOK II.

INDUCTION OF MAGNETISM.

Page
1. BY A MAGNET,..... 139
2. BY A CURRENT OF ELECTRICITY,..... 159
3. BY THE EARTH,..... 223

BOOK III.

INDUCTION OF ELECTRICITY.

1. BY A CURRENT OF ELECTRICITY,..... 227
2. BY A MAGNET,..... 264
3. BY THE EARTH,..... 306

INTRODUCTION.

DEFINITIONS AND EXPLANATIONS.

1. MAGNETISM. — The term *magnetism* expresses the peculiar properties of attraction, repulsion, &c., possessed, under certain circumstances, by iron and some of its compounds, and in a somewhat inferior degree by nickel, a closely-allied metal. Cobalt is perhaps slightly magnetic.

ELECTRO-MAGNETISM. — That branch of science which relates to the development of magnetism by means of a current of electricity, is called *electro-magnetism*. It will be treated of in Book I. Chapter 2, and in Book II. Chapter 2.

MAGNETO-ELECTRICITY treats of the development of electricity by the influence of magnetism, and will form the subject of Book III. Chapter 2.

2. MAGNET. — The body which exhibits magnetic properties is called a *magnet*. This name is confined to the metallic substances mentioned above; but all conductors of electricity are capable of exhibiting similar attractions and repulsions while conveying a current.

NATURAL MAGNETS. — Certain ores of iron are found to be possessed of the magnetic properties in their natural state. These are called *natural magnets*, or *loadstones*.

ARTIFICIAL MAGNETS. — Bodies belonging to the magnetic class, in which magnetism is artificially *induced*, are called *artificial magnets*.

3. INDUCTION OF MAGNETISM. — Whenever magnetic properties are developed in bodies not previously possessed of them, the process is termed the *induction of magnetism*. When this is effected by the influence of a magnet, it is called *magnetic induction*; when by a current of electricity, *electro-magnetic induction*.

INDUCTION OF ELECTRICITY. — This term expresses the development of electricity by the influence of other electricity in its neighborhood, or by the influence of magnetism. In order to distinguish the inductive action of an electric current from the *static induction* of electricity at rest, the former is called *electro-dynamic induction*. The development of electricity by the influence of a magnet is termed *magneto-electric induction*.

4. POLES. — The magnetic phenomena manifest themselves principally at the two opposite extremities of the magnet; the force of the attractions and repulsions diminishing rapidly as the distance from them increases, until it becomes entirely insensible at the middle point. These extremities are called the *poles* of the magnet.

5. The earth itself is found to possess the properties of a magnet, having magnetic poles corresponding nearly in their direction with the poles of its diurnal rotation. Now, if a straight magnet be suspended so as to allow of a free horizontal motion, it will be found to place itself in a direction nearly north and south; as will be explained hereafter. The end which turns towards the north is called the *north pole* of the magnet, the other end its *south pole*. Hence every magnet, whatever its form, is said to have a north and a south pole. In the figures to be hereafter described, the north pole is indicated by the point of an arrow, and the south pole by the feather; or by the letters N and S respectively. The *poles* of a galvanic battery will be described farther on, when treating of that instrument.

6. Permanent Magnets. — It is found that pure soft iron easily acquires magnetism when exposed to any magnetic influence, but immediately loses this magnetism when that influence is withdrawn. But steel, which is a compound of iron with a small quantity of carbon, and especially hardened cast-steel, though it acquires the magnetic properties less readily, retains them more or less permanently after they are acquired. Hence a magnet formed of hardened steel is called a *permanent magnet*.

7. Bar Magnet. — An artificial permanent magnet, in the form of a straight bar, is called a *bar magnet*.

Fig. 1.

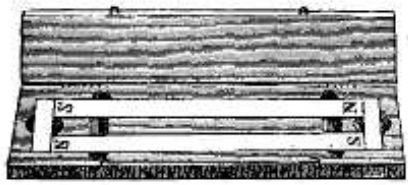


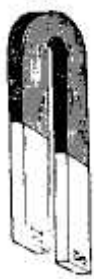
Fig. 1 represents a small case, containing two bar magnets, with two short pieces of soft iron connecting their poles: these act as *armatures* (see § 9), and serve to preserve the power of the magnets. The magnets, when not in use, should be kept packed in the case, with their opposite poles connected by the armatures, in the manner shown in the cut.

Compound Bar Magnet. — A magnet composed of several straight bars joined together, side by side, with their similar poles in contact, for the purpose of increasing the magnetic power, is called a *compound bar magnet.*

Fig. 2.

Such a magnet, composed of three simple magnets, fastened together, is represented in Fig. 2.

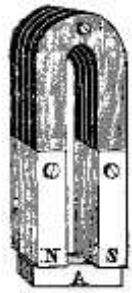
Fig. 3.



8. Horseshoe or U-Magnet. — A magnet which is bent into such a form as to bring the two opposite poles near together, so that they can be connected by a short, straight piece of iron, is called a *horseshoe* or *U-magnet.*

Fig. 3 represents a steel magnet of this description.

Fig 4.



COMPOUND HORSESHOE MAGNET. — A magnet composed of several horseshoe magnets joined together, side by side, as in Fig. 4, for the purpose of increasing the power, is called a *compound horseshoe magnet*, or *magnetic battery*. These magnets are charged separately, and are put together with all the similar poles in the same direction.

9. ARMATURE. — A piece of soft iron, adapted to, and intended to connect the poles of a magnet, is called an *armature*, or *keeper*. Horseshoe magnets are usually provided with an armature, consisting of a straight bar of iron, for the purpose of preserving their magnetic power: this should be kept constantly applied to the poles of the magnet when it is not in use; as shown in Fig. 4, where A is the keeper. Armatures are employed in various experiments, and their forms vary with the purposes intended.

Fig 5.

10. MAGNETIC NEEDLE. — A light and slender magnet, mounted upon a centre of motion, so as to allow it to traverse freely in certain directions, is called a *magnetic needle*. It may be so mounted as to move only horizontally, as in Fig. 5; or its motion