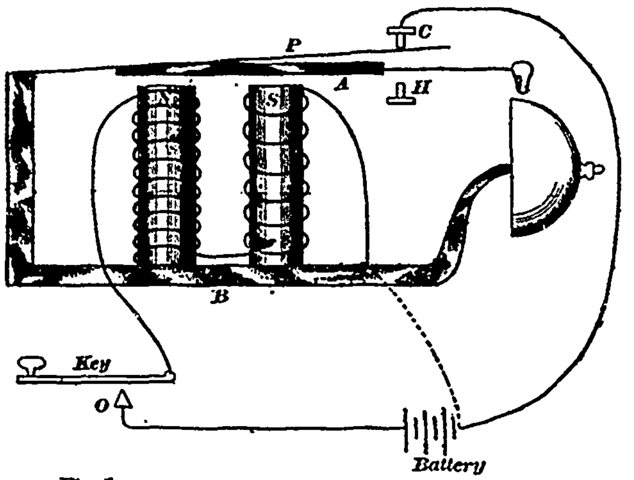
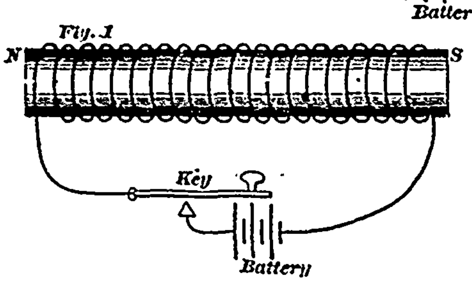
wire encircling the core, and that immediately on the cessation of the flow of electricity it almost as readily loses its magnetism. It will readily be understood from Fig. 1 that the closing of the circuit by depressing the Key K will allow the current to flow through the wire around the core and make it a magnet, but only for the time during which the key is depressed and the circuit remains closed. On arresting the flow of the current by releasing the key, the magnetic effect in the iron core is at the same instant also arrested. The softest and the best iron only should be used for the purpose for the reason that cores of electro-magnets composed of good, soft iron retain but little magnetism when the influence of the current is removed by opening the circuit, whereas, if made of cast or an inferior quality of iron the magnetism is retained and the action is sluggish.

Fig. 2 diagrammatically represents an electro-magnet of a form very generally employed for telegraph instruments, electric bells, etc. N and S are simply pieces of round Norway iron screwed by means of an iron screw, or riveted with an iron rivet in the plate B.

It is of the utmost importance that the cores of iron make surface and solid contact with the iron yoke piece B.

C is a simple spring contact key for temporarily closing the electrical circuit when depressed, normally it leaves the circuit open. By depressing the key until it comes in contact with the anvil O, the current will flow from the battery through the key,





out by the anvil O, through the helix surrounding N S, to the metal frame along which it travels to the armature A, out by the spring to S and back to the battery at the opposite pole to that from which it entered. The effect of the depression of the key is then to magnetize N S, which attracts the soft iron armature A until the ball at its free end strikes the gong. The instant the hammer strikes the gong the spring will be drawn out of contact with the screw C, and the circuit will be again open for an instant and until the spring and screw C come again in contact. N S will lose their magnetism on the opening of the circuit, and the armature will instantly be carried back by the tension of the spring, and the current will again be established and so on, causing the armature to vibrate and the hammer to strike the gong at each vibration. This is the principle upon which all vibrating bells are constructed.

There is very little difference between the action, etc., of an electric bell and the *Morse* telegraph instruments. If, for instance, we remove the long spring P from the bell armature A, so that the armature plays between the studs C and H, and if we also remove the wire from C and connect it with the end of the helix on S, we then have a simple Morse telegraph instrument, which may be read by the sound of the armature beating against the studs.

If we substitute a stylus for the hammer at the end of armature and cause a ribbon of paper to travel above, but within striking distance thereof, we then have a Morse recording telegraph instrument.

We have already stated that dynamo machines are divided into two classes, viz. *alternating* current machines which, as their name implies, supply only alternating currents, and *direct* current machines, which generate a current always flowing in one direction. Each machine can use either permanent or electro-magnetic fields.

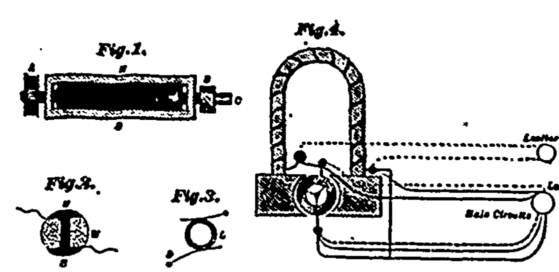
By the difference of the winding and arrangement of the wires, these two classes, *i.e.*, alternating and direct current machines, are again, to meet special arrangements, divided into what are termed *series* and *shunt* wound machines and different combinations thereof.

The series machines give a constant current with a varying electro-motive force, while the shunt wound machines give a varying current and a constant electro-motive force, one being the opposite to the other.

Then, again, there are self-exciting and separately-exciting machines, which may be either shunt or series wound, sufficient magnetism is always retained in the field magnets to feebly act from the start on the armature, which, as its speed of rotation is increased, cuts more *lines of force*, and in proportion thereto, generates a stronger current, which, passing through the field magnet coils in the proper direction, increases the strength of the field magnets, which again in turn so influences or acts upon the armature that it gives out a proportionately increased amount of electric energy. The self-exciting machine would appear to be an electric accummulator. A separately-excited machine is used with alternating current machines unless the latter have a permanently magnetized field.

The exciter is generally a small dynamo, or it may be a voltaic battery, placed in circuit with the field magnet only; its office being to magnetize the field to *saturation*. The commutator on an alternating generator, or machine, is required to convert the alternating impulses into a direct flowing current. Such convertion is sometimes necessary, but whenever resorted to it is attended at all times with a considerable loss of energy.

The alternating machines are more simple in construction and have the advantage of furnishing a higher E.M.F. at less cost than a direct current dynamo machine. They can also be advantageously employed for supplying incandescent lamps, especially on long circuits. For supplying arc electric lights, the direct current machines are best, as they are made simple to



manipulate. They can be used for both arc and incandescent lamps, driving motors or electro-plating, etc., whereas, to do more than to light incandescent lamps the alternating machines have to be furnished with special appliances which increase the cost and the complications.

We would recommend our readers, whose intention it is to build a dynamo machine for their own use, to build it on the Siemens pattern, as this is a simple machine to construct and will, to the amateur, give greater satisfaction than any other.

We may have something more to say regarding the converters and the special apparatus above alluded to. Although the forms of field magnets may differ so much in outward form, the same principles underlie all, as the object of the manufacturer is to construct a machine which will concentrate the greatest number of lines of force on each successive coil of the armature.

The different designs of armatures, although not so numereus as the different designs of field magnets, are far too numerous for us to attempt to describe here. We will, therefore, confine ourselves to two or three of the most simple and generally approved types, commencing with the Siemens and Gramme, which are among the oldest. It would be safe to say that nine-tenths of all the dynamos on the market are simply modifications of one or the other of these.

Fig. 1 shows a longitudinal view of the Siemens armature, N S representing the poles, W the wire, A the driving wheel, B the commutator, and C the shaft.

Fig. 2 represents a cross section of the armature, and Fig. 3 a cross section of the commutator, with the brushes D D resting thereon.

Fig. 4 shows a Siemens armature revolving between the poles of the field magnets. The thin lines represent the circuit or path the current traverses to make it a series-shunt or separately-excited machine. The heavy lines show the complete circuit and winding of the shunt system, and the dotted lines show the circuit of separately-excited field magnets, with winding and circuit complete.—*Scientific Machinist.*

LEGAL DECISIONS.

TELEGRAPHIC CORRESPONDENCE, AGENCY.—According to the decision of the Supreme Court of Minnesota, in the case of Magie *v.* Herman et al., where one commences a correspondence with another by telegraph he makes the telegraph company his agent for the transmission and delivery of his communication, and the transcribed message actually delivered is primary evidence, and if lost or destroyed its contents my be proved by parol.