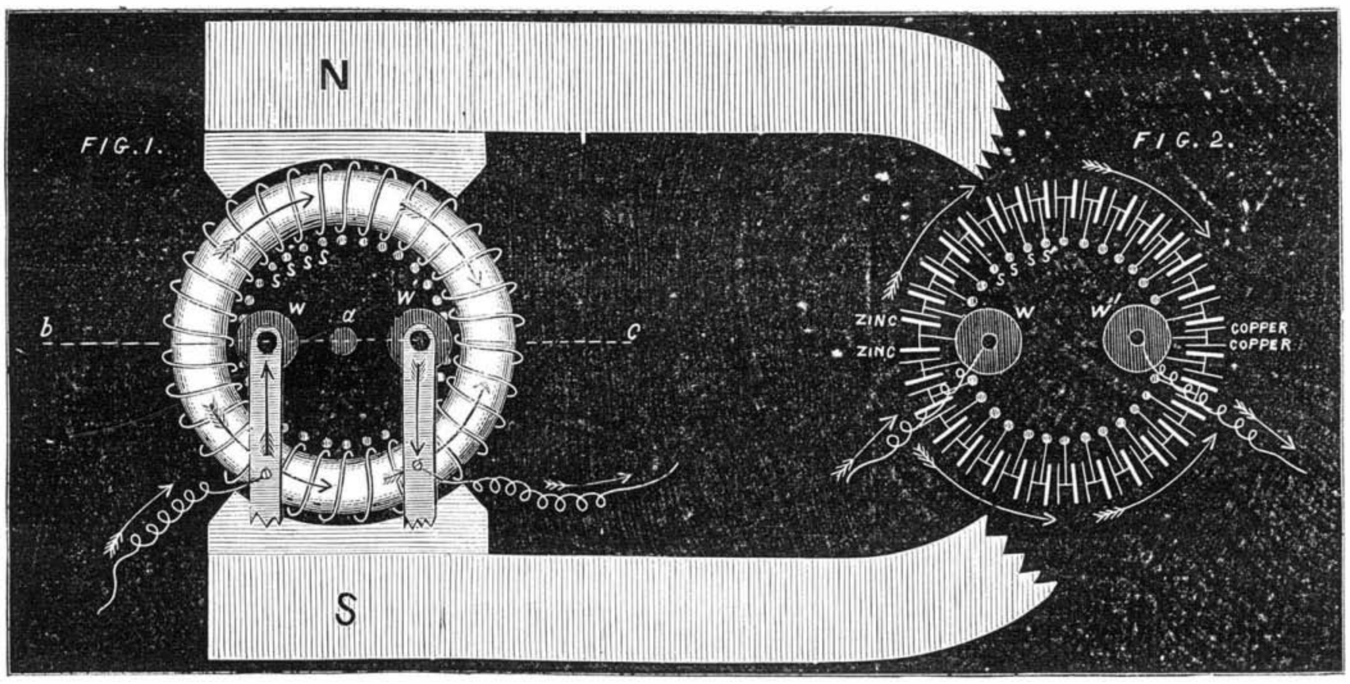
NEW MAGNETO-ELECTRIC MACHINE.

In all the magneto-electric machines hitherto constructed, only an approximation to a continuous current has been arrived at, and that either by making each machine a compound one, having several armatures arranged so that, when the current ceased in one, it was taken up by the next, and so on, or, in other machines, by driving the armature or armatures at a very high velocity, so that the interval between the cessation of one current and the commencement of the next became inappreciable.

In M. Gramme's machine, says the *Mechanics' Magazine*, the current, whether the machine be turned slowly or quickly, is continuous. Fig. 1 is a theoretical representation of this machine. It consists of a horseshoe magnet, N S, between the poles of which turns an iron ring with an insulated wire wound round it in one continuous length. The inner beads of the turns of this wire are connected with small studs, *s s s s*, insulated from one another. The edge of the faces of two wheels, *w w'*, press against these studs, as shown, so that as the iron ring with the wire wound around it rotates, three or more of these studs are always in contact with them. In the actual machines, each of the turns, as represented in the engraving, is really a separate coil of several turns of wire, the junctions between the ends of one coil and the next being connected with the studs; and the iron ring is not necessarily one of round iron, but may be, or rather is, a short and very thick soft iron tube, and the permanent magnet a proportionally broad compound one. The action of the machine may be explained as follows: Let us regard the turn of wire just above the line, *b a c*, on the left hand side of the ring. The portion of the iron ring above this turn, that is to say, the portion nearest the pole, N, has the same polarity as that pole, while the portion of the ring below the turn has southern polarity. Now as the ring rotates about *a*, the portion of the ring above the line, *b a c*, becomes more strongly north as it approaches N, and the part below less south as it recedes from S; and, finally, when it arrives at N, the polarity on both sides is the same, which is as much as to say there is no magnetism in it. This change causes a current of electricity to be induced in the wire. As the turn now moves on towards S, the iron in front becomes a south pole, and that behind a north pole, until it arrives at the line, *b a c*, when the difference of polarity is greatest. This change sends another current through the wire, which, as the turn has become turned over in position, will be in the same direction as the former one, or rather will be a continuation of the first current, so that the turn of wire, in changing from *b* to *c*, has a continuous current induced in it, as have in like manner all the turns before and after it. As now the turn moves further still, the magnetism becomes less and less, as at first, and finally, when at S, disappears, and on going still further becomes reversed as before; this causes a current to circulate through it in a reverse direction to the former one, and so also for all the turns before and after it; these currents together pass out through the studs, in contact with the wheel, *w*, and return when the circuit between the two wheels is completed (as they must be of course before any current can flow) through the wheel, *w'*, and thus a continuous current is kept up as long as the wheel is kept rotating. The circuits of the machine are precisely similar to two sets of cells joined up for quantity, that is to say, the last zinc plate of one set is joined to the last zinc of the other set, and also the last coppers are joined, as shown in Fig. 2, each cell representing one turn, or in the actual machine one separate coil.

It will be seen that as each wheel always presses against three or more studs, the coils between these studs are short circuited, and do not add their power to the others. The resistance of the wire in the machine will be the resistance of the length of wire between the stud pressing against the higher part of the wheel, *w*, and the stud pressing against the higher part of the wheel, *w'*, taken parallel with the length of wire between the studs pressing against the lower part of the wheels, which is equivalent to rather less than a quarter of the resistance of all the wire taken in one length. The resistance is not exactly a quarter, because the coils between the studs pressing on the wheels are in short circuit, and do not add their resistance to the other wire. By constructing the coils of thick wire, a current of great quantity can be obtained, or with a larger length of thin wire, one of great intensity. The electro-motive force of the current is directly proportional to the rate of rotation of the coils—that is, when the rotation is not extremely rapid, for the demagnetization of the iron requires a certain time. The machine, from its great simplicity, is likely to have an extended use for such purposes as electrotyping, the electric light, etc.



MAGNETO-ELECTRIC MACHINE.

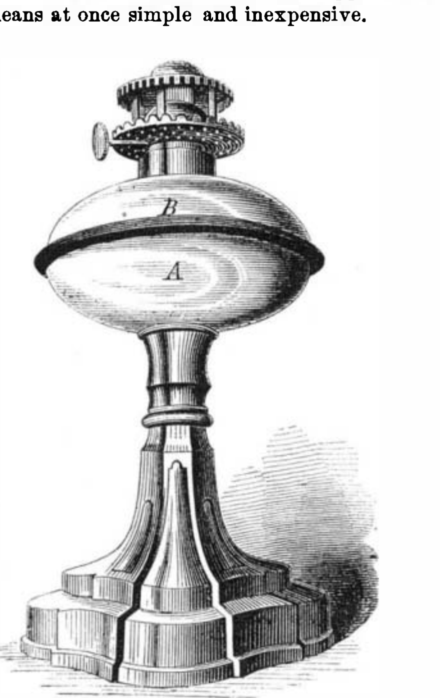
Lac Anilines for Staining Paper, Leather, etc.

Springmuhl states that paper has hitherto been stained in two ways: either the material, previous to manufacture, was dyed with a substantive color, or an adjective color was applied to the finished paper. In the former case, a product was obtained colored through and through; in the latter, the color is only on one side. With a compound of resinous matter and aniline colors dissolved in alcohol, the paper can be rapidly colored at once, on both sides, in the most splendid manner and in an infinite variety of shades. The best resin for the purpose is shellac, to which a little sandarach or turpentine may be added. The resinous aniline solution interpenetrates the whole mass of the paper, giving it a completely even color, and a considerable luster. The two alcoholic solutions of color and of resin may, if needful, be kept separate till required for use.

Every kind of paper, sized as well as unsized, can be prepared in the same manner. The process is very simple: the sheets of paper are drawn through the solution placed in a shallow vessel, and afterwards hung up to dry. By wetting one side of the paper, the same result may be produced, if the texture is not too thick. If the paper is thoroughly interpenetrated with color, it becomes, when dry, so compact and dense that one side can be subsequently treated with a different color. By adding a small quantity of an essence, the paper may at the same time be perfumed. Leather, etc., may be treated in the same manner.

SAFETY KEROSENE LAMP.

Many of the accidents resulting from the use of kerosene arise from the breaking of the glass reservoir when the lamp is overturned by any cause. To obviate this is the intention of the invention we illustrate, and the object appears to be attained by means at once simple and inexpensive.



At A is shown the glass reservoir of the lamp, and at B a ring of india rubber which surrounds its largest circumference. A groove is formed in the glass, into which the rubber ring falls far enough to be kept securely in place, while, at the same time, it projects a sufficient distance from the reservoir to form a protective cushion on every side. Upon the lamp being overturned, the india rubber cushion receives the force of the concussion and preserves the glass from injury. We have upset the lamp from which our cut is made a great many times, to test its strength, without effecting any damage whatever.

Patented through the Scientific American Patent Agency, April 16, 1872. Further information can be obtained of the inventor, Mr. Adolph Otto, whose present address is 76 Ann street, New York city.

PENCIL LEADS.

Graphite, clay, and water are the ingredients of the leads used in the ordinary forms of pencil cases sold by jewelers and stationers. The graphite, or blacklead, as it is commonly termed, that is employed for the purpose is of the finest quality. After being ground to a powder, it is mixed with a peculiar dark blue clay, which is imported from Bavaria, and the whole is kneaded with water until it assumes the consistence of putty.

The apparatus used in the manufacture consists of an iron cylindrical vessel, which is usually of about seven inches in diameter, and constructed of sufficient strength to withstand heavy pressure. In the center of the bottom of this vessel, a small round hole is pierced, and inside the cylinder is a closely fitting movable steel plate which also has an aperture in its center, so that, when it is placed on the bottom of the vessel, the two openings coincide. The hole in the plate, however, is the smaller, being of a diameter equal to that of the leads to be made—so that larger or smaller apertures and, consequently, different plates are required for the various sizes of leads.

Into the above mentioned vessel, after the plate on its bottom is adjusted, the mixture is packed, which, on being forced down by a heavy pressure, is driven out through the hole in long flexible threads. These are received on sheets of metal, and each sheet, as soon as filled, is placed in an oven. The length of time occupied in the baking depends upon whether the leads are to be hard or soft; if the former, they are kept in the oven for some time, if the latter, a short period suffices. This process completed, the threads are broken up into short pieces and arranged according to their sizes. There are nine of these sizes in the trade, numbered from 1 to 9 according to the length of the pieces.

The finished leads are sent to the market packed in little boxes. The latter are either turned from wood or else pressed by dies from thin sheets of tin or brass. Large numbers of them are manufactured at Waterbury, Conn.

Leads at wholesale sell at three dollars per gross. The trade, which is supplied mostly from manufactories in Philadelphia, is, we should judge, of rather limited proportions, as one of the largest dealers in this city informs us that his sales rarely exceed three thousand gross per annum.

SCARLET DYEING ON WOOL AND SILK.—Jegel proposes the following method of dyeing wool and silk scarlet by the simultaneous action of magenta and dinitronaphthol or naphthaline yellow. The less magenta is employed, the better. The method is to heat a dilute aqueous solution of naphthaline yellow to near boiling, add so much magenta as amounts to two per cent of the naphthaline yellow, and then dye. The dye liquor must not be mixed when cold. If this is done, all the magenta is thrown down in an amorphous flocculent state. If this has taken place, the subsequent application of a boiling temperature does not remedy the mischief, since a part only of the magenta thus precipitated is redissolved, the rest melting together into a greenish golden mass. In this state, the liquid is quite unfit for dyeing, and even if filtered gives no good shades.

PREPARATION OF PURE INDIGOTINE BY MEANS OF CARBOLIC ACID.—According to Mehu, carbolic acid, with the aid of heat, has the power of dissolving indigo blue readily. On cooling, the greater portion is deposited in a crystaline state. The cold solution has an intense purple blue color. In order to prevent the carbolic acid from congealing as it cools, a little alcohol may be added, which causes the greater part of the color to be deposited. Instead of alcohol, camphor may be used to the extent of one-fifteenth, or benzine. By using 500 grammes of carbolic acid, we can obtain two grammes of pure indigo blue (indigotin) in crystals which, under the microscope, appear remarkably regular. Mehu employs indigo which has been previously washed, first with water, then with very dilute hydrochloric acid, and then repeatedly extracted with boiling alcohol.

COATING ZINC WITH IRON.—The objects should first be plunged into a hot solution of 160 gms. ferrous sulphate and 90 gms. sal ammoniac in 2,500 c.c. of boiling water. After two minutes' exposure, they should be removed and brushed off in water. This has for its object simply the cleansing of the surface. They are then again placed in the bath and heated, without brushing or washing, until the sal ammoniac fumes are gone, then washed, and this operation repeated three or four times, when a coating of iron will be formed on the zinc, which takes a fine polish under the brush.—*M. Puscher.*