as it is quite possible to receive a severe shock from this machine. The description of this dynamo, in connection with scale drawings, will be presented at an early date in the SCIENTIFIC AMERICAN SUPPLEMENT, together with the various methods of connecting the wires of the field magnet, and points in regard to external circuits. The results of dynamometric and electrical tests will also be given.

EXERCISES IN PRESTIDIGITATION.

I recently had an opportunity of being present at some amusing experiments of a prestidigitator, who was good enough to let me into the secret of his most curious tricks for the benefit of the readers of *La Nature*. Although it merely concerns the question of a deception of the eye, I shall make known the means employed for changing ink into water, or, rather, for really making credulous spectators believe that ink can be so changed.

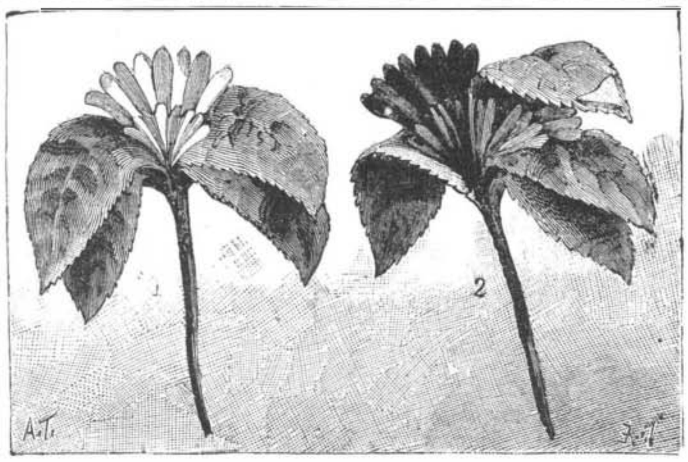


Fig. 2.—THE MAGIC FLOWER.

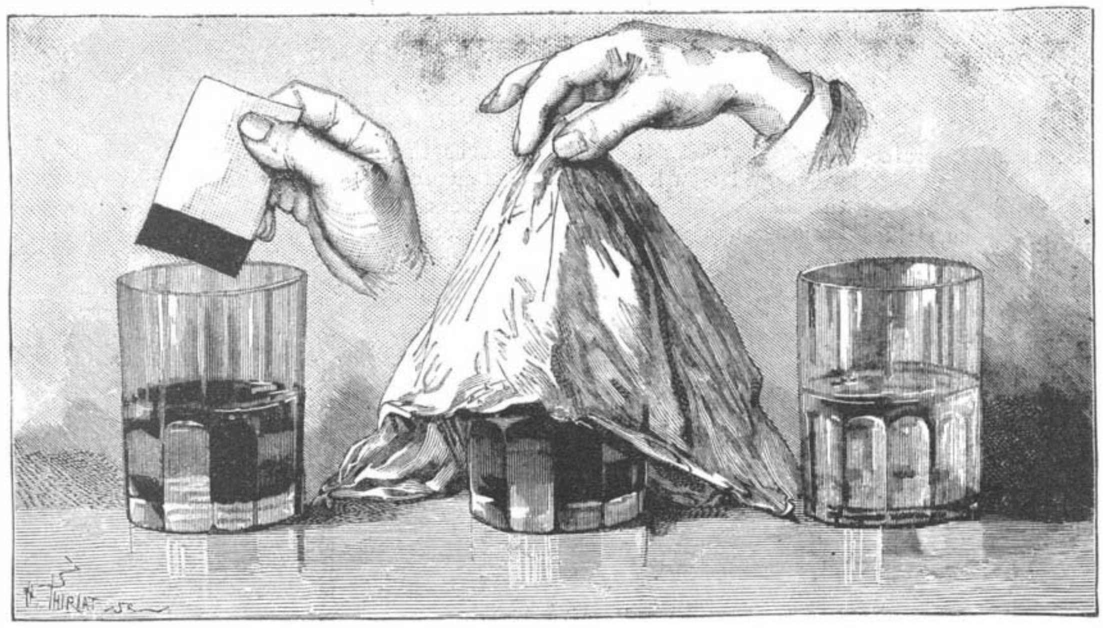


Fig. 1.—INK CHANGED TO WATER.

The prestidigitator places upon a table a glass half full of a black liquid that has every appearance of being ink. He shows the spectators a white card, dips it into the glass, and takes it out stained with black (Fig. 1, to the left). This done, he conceals the glass under a napkin or handkerchief; then he suddenly removes the latter, and the glass is seen to contain a clear liquid, which is water (Fig. 1, to the right). This trick excites very great astonishment when it is well performed; but nothing is easier than to repeat it.

Pure water is poured into a tumbler, and the lower part of the latter is lined with a strip of black cloth, flannel or cashmere, up to the level of the liquid. At a certain distance off this gives the water every appearance of being ink. Previous to this a card has been prepared by coloring a third of one of its sides with black ink. When this card is shown to the spectators, it is presented to them white side foremost. After it has been dipped into the alleged ink, it is turned around so as to show the inked surface, and it then appears as if it had really been immersed in ink.

Then the glass is covered with the fabric, and the latter is inserted into it far enough to allow the fingers to grasp the black lining and quickly remove it, and thus make the black liquid appear as water.

This experiment shows with what facility certain mystificators can practice deceit when they present their experiments as being under the influence of supernatural agents.

Experiments of the same nature may be more scientifically performed by means of chemical precipitates. Add tincture of iodine to crystallized acetic acid, and you will obtain a red liquid having the appearance of wine. Pour into the mixture a solution of hyposulphite of soda, and you will obtain a milk-white liquid, and the wine will seem to have been converted into milk. Put some iodide of potassium into an aqueous solution of a salt of mercury (the bichloride, for example), and you will have a red precipitate of iodide of mercury. An excess of the reagent dissolves the precipitate, and the color disappears. This latter experiment is very curious, since the two liquids have the appearance of water. While we are on this subject, we may mention, in conclusion, the curious tri-colored artificial flower that a toy manufacturer annually brings out (Fig. 2).

To the left of this figure (No. 1) we see a white flower. This, by an abrupt movement of the arm, is rendered red, and then by another movement blue. The white flower, which is of thin paper, is folded like a fan, and is placed between two flexible leaves, that are provided at their upper extremities with a small piece of lead. By a dexterous movement the green leaf is raised and the white flower is folded under its weight, and a red flower makes its appearance on one side and a blue one on the other. If the motion be quick, the eye cannot discern the means that are employed to effect the transformation, which may be regarded as an amusing optical experiment.—*La Nature*.

THE POLAR BEAR AND SEALS.

On the long stretches of ice-covered coast in the polar regions, the largest beast of prey of the North—the white or polar bear—lives undisturbed by all other animals, seldom meeting even the walrus or seal hunters in this vast desert. If a bear is discovered on floating ice, it will usually jump into the water on the approach of the boat, in order to reach the shore or a larger field of ice, and this is the time when he can be most easily killed. Rowed by strong arms, the boat will soon overtake the fugitive; but it should be kept at a proper distance from him, so that he can be shot by one of the occupants of the boat. The capture is not always an easy matter, however. The Scotchman

THE POLAR BEAR AND SEALS.

Lamont, who hunted walruses for many years, tells of one such chase in which, when the boat had approached within fifty feet of the bear, he turned suddenly and swam toward his pursuers. The original intention of harpooning him was abandoned, and a well aimed shot killed him when he was very near the boat. Scoresby relates an amusing incident which occurred during a "water hunt" of this kind, which came very near having a tragic ending. On this occasion the bear swam to the boat, climbed in, and remained there quietly, while the terrified men sprang overboard, and clung to the boat until the men in a second boat, which came to their assistance, shot the intruder.

The food of polar bears consists principally of the refuse of the sea, that is, the bodies of the larger animals which are washed up by the sea; but they also attack living seals and walruses, and the deep scars on the bodies of the latter which are taken by the seal hunters prove that the bears are not afraid to attack these immense creatures. They prefer to surprise the walrus in his sleep, and at such a time a bear will fix his teeth in the walrus' neck and hold him while he strikes him with his paw, first stunning and then killing him. If, by scent or sight, a bear discovers seals sleeping on the ice, he slips noiselessly into the water and swims to the desired place, rises, under the protection of a ledge if possible, so as to obtain a good view of his prey, and selects a seal which is sleeping near the edge of the ice. Then he approaches his victim, strikes him a sudden, heavy blow with his paw, breaking his back, and throws the unfortunate seal about on the ice, while his companions hasten back to the water.

The order of things is reversed if seals meet their foe in the water. Sure of their greater facility in swimming and diving, the seals have no fear of the bear, and they know how to tease him, swarming about him, then suddenly diving out of sight, and then reappearing. Lamont, who has often witnessed such scenes, compares the conduct of the seals on occasions of this kind to the hectoring of large birds of prey by small birds.

Our cut shows a polar bear on floating ice trying to satisfy his hunger on remnants of a walrus' skeleton, but he is disturbed in his occupation by some merry seals swimming near the ice. The bear looks covetously at the sleek, fat seals, and then returns ill-naturedly to the dry walrus bones.—*Illustrirte Zeitung.*

CONDUIT FOR UNDERGROUND CONDUCTORS.

It is a well known fact that the electrical wires that now cover the roofs of almost every building in the large cities and cumber the streets have been the indirect cause of the destruction of much property, and perhaps of the loss of life, by most seriously delaying and interfering with the firemen. The necessity for getting rid of this nuisance has caused inventive genius to devise means for accomplishing this object. The illustrations herewith presented represent a conduit for electrical wires of all descriptions. It consists of rectangular tubular blocks, about four feet in length and a foot square. Each block is provided with a male and female joint, as shown in the sectional view, Fig. 3. The conduit is formed with nine ducts, each of which will hold one hundred and fifty telegraph wires, or two hundred telephone wires, or seventy-five electric light wires. The material of which the conduit is constructed is of the nature of a cement, which quickly hardens when exposed to a chemical process in an air tight inclosure. The material is then unaffected by heat or cold, is impervious to moisture, is capable of standing a pressure of 3,441 pounds to the square inch, is hard as the hardest cement, and is, it is claimed, as good a non-conductor as glass. The process of manufacturing these conduits can be carried on rapidly, and they can therefore be made at a reasonable cost. Fig. 1 is a perspective view, showing the conduit as it is laid for the reception of wires. Suitable branches are provided, whereby wires can be carried into each house along the line.

This conduit is manufactured by the American Conduit and Conducting Company, of 7 Charlestown St., Boston, Mass. Applications have been made for patents on improved machinery, by means of which this conduit can be cheaply made. The capacity of four of these machines is one mile in seven days.

An Interesting Family.

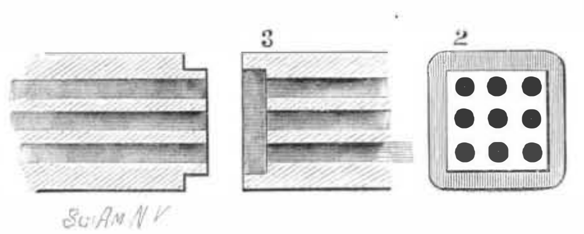
"Spiders! What can any one find interesting in those ugly little creatures?" is a question I often asked before I made the acquaintance of "my family." The interest which I felt in its members led me to examine more closely the life and habits of spiders, and I find that observation not only deepens my interest, but also increases my admiration for this wonderful animal, which was first awakened by the mother of "my family." I first saw her moving slowly over a stone. Something, I knew not what, gave her such a peculiar appearance that, overcoming my natural aversion to spiders, I secured her in a box in order that I might examine her to better advantage.

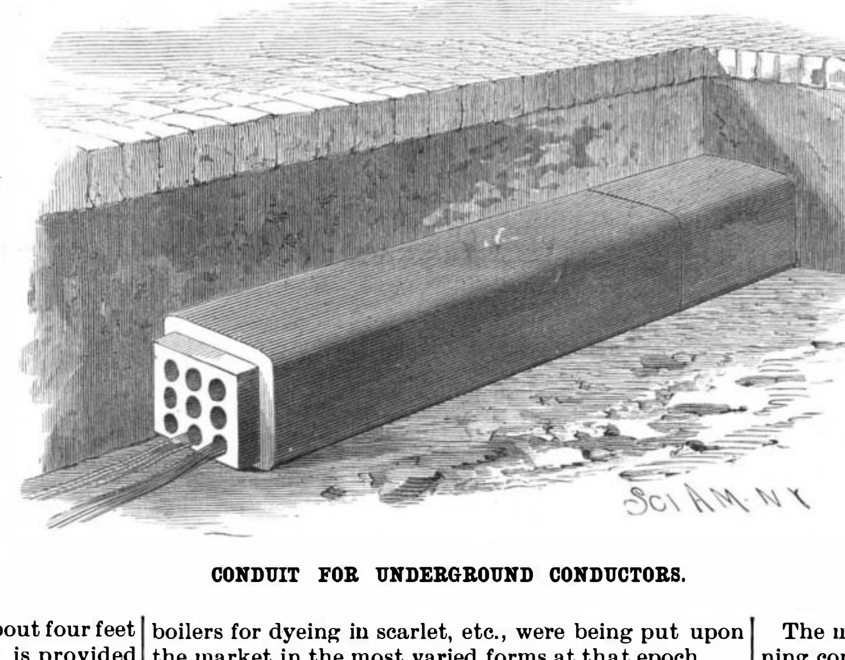
The back of her abdomen was very rough, and its surface seemed to be in constant motion. The microscope showed that the abdomen was covered with young spiders. At first they were not very active, and seldom left their mother; but after a couple of hours they endeavored to escape whenever the cover was removed from the box in which they were confined. On attempting to pick up one of them, I found it had attached itself, by a minute thread, to its parent. Different trials showed that each little spider took the same precaution against any possible accident.

Although the family was well supplied with flies and other insects, they seemed to prefer each other, and their number rapidly diminished, until one day the whole family met with a fatal accident. This I have always regretted, as it prevented my learning the name of this strange family, but from what I know of the tarantula, I think it may have been a relative.—*The Owl.*

Modern Uses of Tin.

The uses of tin have greatly increased during the last few centuries of our era. Salmon, in his splendid work on casting tin (1788), describes the methods of work, and mentions the objects manufactured from this metal. We see from the plates of his atlas that table services (spoons and forks), pitchers, jugs, candelabra, lamps, surgical instruments, chemical apparatus,





CONDUIT FOR UNDERGROUND CONDUCTORS.

boilers for dyeing in scarlet, etc., were being put upon the market in the most varied forms at that epoch.

Griffith, between 1840 and 1850, perfected the manufacture of tin utensils in a single piece. This industry became especially developed in France from 1850 to 1860.

In 1876 America began manufacturing impermeable boxes, without soldering, from single pieces of this metal.

To-day, tin is being used in the manufacture of bronzes for guns, money and medals, and in the alloys used for making measures of capacity for liquids. Its unalterability in the air, and the harmlessness of its salts when they exist in small quantity, cause it to be employed in our day in the manufacture of culinary vessels and utensils. Advantage is taken of its malleability to form from it those thin sheets that are used as wrappers for chocolate, tea, etc.

In the various bronzes that it forms with copper, we have evidence of the influence that the relative proportions of the two metals has upon the properties of the alloy. Thus, gun bronze, which contains 10 parts of tin to 90 of copper, is remarkable for its tenacity. The bronze of tom-toms and bells, which differs from the last named only in its larger proportion of tin (20 to 80 of copper), is, on the contrary, very brittle, although it fortunately possesses greater sonorousness than gun metal does. On still further increasing the proportion of tin to 33 parts per 67 of copper, we obtain a white alloy, capable of taking a polish that causes it to be used for the manufacture of telescope mirrors. Upon uniting with tin, copper loses its ductility. The alloys of these two metals increase in density through being hardened, as they do also by being hammered.

A mixture of 20 parts of tin with 80 of copper gives an alloy which is brittle at a bright red heat and when cold, but which is malleable at a dark red heat.

When alloyed with lead, tin forms plumbers' solder. Associated with mercury, it gives the silvering of looking-glasses. Besides this, it enters into a host of fusible alloys or compositions, known under the general name of white metal. One of these alloys, composed of tin, antimony, and copper, is very much used as a bushing for engine bearings. For this purpose, the following are very good proportions: Tin, 100; antimony, 10; copper, 10. It is also alloyed with antimony alone, or with bismuth. It serves for tinning copper and iron kitchen utensils. To this effect, the wrought iron utensils are first cleaned with sand and then wiped, and afterward immersed in a bath of molten tin, and finally rubbed with tow saturated with sal ammoniac. Food cooked in tinned vessels has a slight fishy taste, because it dissolves a little of the tin, just as food prepared in iron contracts a slight taste of ink.

Tin is used in enormous quantities also in the manufacture of tin plate. In order to prepare this, the sheet iron designed for the manufacture of it is cleansed by plunging it into dilute sulphuric acid, which dissolves the pellicles of oxide. Then it is rubbed with sand and immersed in melted tallow, and afterward in a bath of tin covered with tallow. When it is taken out it is tinned, there having formed upon the surface of the sheet iron a true alloy of iron and tin covered with pure tin. Tin plate is as unalterable as tin itself, because the iron does not come into contact with the air at any point; but if, upon cutting it, we expose the iron, oxidation proceeds more rapidly that it would if the iron had not been tinned.

Crystallized Tin Plate.—Upon washing the surface of tin plate with a mixture of hydrochloric and nitric acids, we remove the superficial layer and render visible the crystallized surface of the tin and iron alloy. We thus obtain what is called moire metallic or crystallized tin plate.

Phosphor Bronze.—It now remains for us to say a few words about the new and important use of tin for the preparation of phosphor bronze.

In the melting of bronze, the absorption of oxygen is very detrimental, the formation of an oxide of tin rendering the metal brittle. In former times an endeavor was made to prevent this oxidation by stirring the mass with wood, or by adding a little zinc to it; but for the last fifteen years greater success has been obtained by the addition of a little phosphorus. This substance extraordinarily increases the compactness, toughness, and elasticity of the product, and gives it, in addition, a beautiful golden color.

Guns, statues, ornaments, and bearings are now cast in phosphor bronze with the greatest success.

Kunzel, of Dresden, has taken out a patent for an alloy composed of from one-half to 3 parts, by weight, of phosphorus, from 4 to 15 of lead, from 4 to 15 of tin, and, for the rest, copper up to 100.

Schiller & Sewald, of Graupen, prepare two kinds of phosphor bronze; one with 2½ and the other with 5 per cent of phosphorus. The demand for this article is daily becoming more extensive.

The most important uses of tin are, in Asia, for tinning copper, and, in Europe and America, for the manufacture of objects from tin plate. The manufacture of bronze and white metal likewise consumes a large quantity.—*Bull. de la Societe de l'Indust. Minerale.*

Heating Cars by Steam.

The superintendent of motive power of the New York, New Haven, and Hartford Railroad, Mr. John B. Henney, Jr., has devised a system of car heating which, it is said, has given satisfactory results. The exhaust from the Westinghouse air pump is delivered into the ordinary radiating pipes of the Baker system. A recent trial of the system is thus described:

"In order to ascertain how quickly four cars can be heated by the steam from a locomotive, orders had been given during the forenoon to extinguish whatever fire there might be in the stoves. Then the windows of the cars were raised, and the raw March wind had an unobstructed passage through the cars. When the locomotive was coupled to the train, connection was established between the exhaust steam pipe on the side of the locomotive and the steam pipes that extended through the several cars, the old pipes in the cars being used for the experiment. Despite the frigid atmosphere in the cars at the commencement of the experiment, caused by these open doors and windows, in thirty minutes from the time the windows were closed and steam let on, the cars were as warm as stoves could possibly have made them. The train made the run to New Haven in fifty-five minutes, and the last car was kept as warm as the first. It required no more steam, and, consequently, no more fuel, than was needed to run the engine, the steam used for heating having before been wasted. The pipes are so arranged that, in case of accident, the steam can be let out instantaneously from the outside of the car, thereby preventing any injury from scalding by steam."