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Contents:

(Illustrated articles are marked with an asterisk.)

A FEW WORDS OF ADVICE AND ENCOURAGEMENT TO INVESTIGATORS AND INVENTORS.

Persons enlightened enough to follow the line of pursuits of which we spoke in our last (page 351), namely, informing themselves by consulting and investigating the transactions of learned societies and the back volumes of scientific journals, complain often as to the difficulty of finding details on particular subjects; and we confess that there is some difficulty, and consequently labor of that peculiar kind which the truly scientific man understand too well, but are too wise to shun. However, the assertion, which we have often heard, that success in such researches is next to impossible, and that scientific discoveries, when inserted in the annals of learned societies or in scientific journals, are buried there, we totally deny. The finding of data on any peculiar subject is an art which, like all others, is attained by practice; besides which, a peculiar condition of mind, enabling persons to concentrate their judgment in this direction, causes some to be very successful in such labors, while others fail. We have had the experience of several assistants in our private laboratory, some of which were rather unreliable in practical experimenting and totally untrustworthy at the balance, but had always the most eminent success when sent to a library in order to hunt up, in the transactions of societies or in scientific journals, data relating to any branch of physics, chemistry, or technology.

Of great assistance are the collected indexes which some societies publish from time to time, and which some journals publish periodically. For the benefit of science, it is desirable that this example were generally followed, and that these indexes were made as full as possible, in which case such an index makes a journal almost equivalent to a scientific cyclopædia. Any one who possesses back volumes of the SCIENTIFIC AMERICAN, and consults the alphabetical index which is appended to every volume, will agree with this statement. The British Royal Society has published already three indexes to its transactions, and the French Academy, to a great portion of its *Mémoires*. The same can be said of the first thirty-one volumes of the *Comptes Rendus*, and of the first ten volumes of Wagner's *Jahresberichte*. Also the "Philosophical Magazine" has its collected indexes. The British Royal Society promised, long ago, the publication of indexes of the principal European journals, whether English, German, French, or Italian. However, these indexes will not contain the subjects, but the names of the scientific men who have labored and published their results. This may appear a drawback; however, when we then refer to the name in a biographical dictionary, we may get the references we want, and, at the same time, many other details, which not only increase the interest, but put us on the track of a great deal more.

Libraries such as the Astor, American Institute, and several others in New York, Peabody in Baltimore, and many other public libraries, in Philadelphia, Boston, and, fortunately, now in almost every large city on this continent, supply the means for ascertaining the history of almost any subject of scientific research. When such a research is once commenced, the student will, while his material accumulates, be always surprised that so much is known respecting the subject under investigation. But, in place of being discouraged, the truly scientific mind will commence to feel, not only a lively interest in it, but a sort of affection for it. It will occupy many of his thoughts, and, if the nature of the subject and his circumstances allow it, he will try experiments of his own. If, then, he is so happy as to discover something really new, his interest will not only be increased a thousand fold, but he will enjoy that delightful and noble self gratification known only to those who, in the paths of Science, discover a new fact, whether it be a geometrical theorem, a new chemical compound, a not yet discovered detail in regard to the properties of sound or light, or an improvement in an apparatus, or even an entirely new piece of mechanism; in either case, the delight is unparalleled by any enjoyment which can befall human nature.

THE GREAT MUSICAL JUBILEE.

The Bostonians are to give us another grand Musical Jubilee this year, to open June 17th and close July 4th. An immense building is now in progress of erection at Boston, which is to be supplied with a gigantic organ. The roaring octavos are to be produced by cannons fired by electricity, the electric keys being placed on the organ and operated, like the other musical keys, by the organist. The clanging notes are to be done by means of a chime of church bells, also worked by keys.

The grand choruses will be sung by twenty thousand performers, representing some two hundred musical societies, from all parts of the country.

The orchestra will be made up of one thousand selected musicians, which, with the military bands, American and foreign, will constitute in all about two thousand players. New York. it is expected, will furnish five hundred of this number; while Boston, Baltimore, Cincinnati, Chicago and other cities of the South and West will make up the remainder.

The instruments for this select orchestra will be as follows: First violins, 250; second violins, 200; violas, 150; violoncellos, 100; contra basses, 100; first flutes, 12; second flutes, 12; first clarionets, 12; second clarionets, 12; first oboes, 10; second oboes, 10; bassoons (first, second, third and fourth), 20; French horns (first, second, third, and fourth), 24; trumpets, (first, second, third and fourth), 24; alto trombones, 12; tenor trombones, 12; bass trombones, 8; bass tubas, 6; tympani (pairs), 6: small drums, 10; bass drums, 4; cymbals (pairs), 4; great drum, 1; great triangle, 1; total, 1,000.

The building, it is calculated, will seat not less than one hundred thousand people. The chorus and orchestra will occupy nearly two acres; while nearly three acres will be given to the audience. The great drum is to be twelve feet in diameter. The frame has just been completed.

Each programme will contain one or more familiar hymns to be sung by the full chorus and audience together. This will be "congregational singing" on a large scale. Among the pieces of this description named are Old Hundred.

The music, for the greater part, will be sacred. The selections announced are principally from the great masters, Mendelssohn being most conspicuous. Handel's oratorio "Israel in Egypt" will be given entire, by a chorus of singers familiar with the music, resident in Boston and its adjacent towns.

A GIGANTIC RAILWAY CAR.

Among the mechanical novelties, to be seen in operation at the Grand Central Depot in this city, is a steam railway car seventy feet wide which travels on a track of corresponding width.

This great vehicle is made in the form of a low platform car, and the track on which it runs is provided with four rails, extending from Fourth Avenue to Madison Avenue. The car is used for the lateral transfer of passenger cars from the main tracks of the Hudson River, Harlem, and New Haven Railways to the various side tracks, thus avoiding the use of turntables. The car is propelled by steam, the engine and boiler being contained within a sheet iron house carried on one side of the machine.

The cars to be transferred are run upon the great car; steam is then turned on and the huge machine trots off with its burden with as much ease as a horse draws a buggy. The machine is supported on eight wheels, arranged on independent axles. There are in addition four driving wheels arranged upon one axle. It was proposed not long ago to construct a grain railway from New York to Chicago, on a gage of 12 feet. That was considered a big thing in the way of broad gages. But it is a pigmy compared with this seventy foot gage railway and locomotive of the Grand Central.

TIN FOIL---ITS USES AND MANUFACTURE.

Every one is familiar with those soft pliable sheets of metal, generally known by the name of "tin foil," with which packages of spice, and tobacco are enveloped. The name itself is a misnomer, for the material of which these leaves are made is rarely pure tin, but generally an alloy or mixture of tin and lead, with often a large preponderance of the latter. The lead is added, not only on account of its rendering the composition cheaper, but also because it gives to the sheet a tenacity which it would not possess if made from tin alone.

Before touching upon tin foil, our subject proper, we perhaps should mention a species of foil which, though almost identical in appearance with the former, is made entirely of lead. It constitutes the linings of those tea chests in which the poorest qualities of tea are imported. The metal of which it is made is carried to China from England in large quantities, averaging some 4,000 tuns per year. The method of manufacture formerly in vogue among the Chinese was exceedingly primitive, as they merely pounded the lead until it attained the requisite tenuity, but in 1858 a rather ingenious invention was patented in England which we believe is still in use both in that country and in China. The subjoined description will doubtless recall to many of our readers the machine, constructed on essentially the same principle now employed for cutting the so-called "wood hangings" or thin veneers of wood designed to take the place of wall paper. A cylinder of lead is cast in a mold, having a mandrel or core in its center. To this cylinder, when cooled, a knife or cutter equaling it in length is gradually brought up until it shaves the surface, the cylinder rotating while being cut. The mechanical arrangement is such that the cutting blade advances gradually toward the axis of the cylinder, and the rate of this advance determines the thickness of the film. The sheet is received on a collecting spindle which is removed as soon as filled.

Tin, as is well known, is extremely malleable, being fourth in this respect on the list of metals, so that it is readily rolled or beaten into very thin sheets. The old method of producing these was simply to hammer the metal on a large flat stone or anvil. One sheet at a time was completed, and the workmen were obliged to use their long handled hammers with much skill, not only to render it of even thickness throughout, but also to avoid pounding holes through its thinner portions. Now, however, the rolling mill has superseded the hammer. For the heavier foils, plates of metal of about half an inch in thickness are cut and simply rolled between powerful steel rollers until they become sufficiently thin. For the more delicate leaves, the process is much more elaborate. Bars, for example, 14 inches long and 1½ inches thick, are rolled out to a length of some six or eight feet. Several of these are placed one upon the other and again put through the mill, their length being thus increased to twelve feet. The sheets are then cut in two, again piled as above described, and once more rolled, this time both lengthwise and in the direction of their width; and so the process is repeated until the requisite tenuity is obtained. In order to prevent the adhesion of the rollers to the metal, the upper and lower sheets of each pile are oiled as they pass through the machine. The last stage of the process consists in piling the leaves in heaps of thirty or forty, cutting the edges and pounding them smooth with a wooden hammer. The sheets are then assorted or further cut up for smaller sizes. Massieri has lately introduced a new method for casting plates of tin of great thinness, which consists in pouring the fluid metal on a cold stone. This process has the advantage of rapidity, as a single man can easily make some 900 sheets per day, which only need to be slightly rolled to render them ready for the market.

As we stated in the beginning, an alloy of lead and tin is generally used in this manufacture. The proportions of the different metals for the purpose are not definitely fixed, but seem to vary according to the ideas of different manufacturers, each one of whom keeps his own notions on the subject, as well as all information relative to the especial details or cost of manufacture of the foil, a profound secret. We learn however that, of late, alloys containing lead have fallen into disfavor, on account of sundry cases of lead poisoning which they have been instrumental in producing. One instance of late occurrence which took place in this city was that of a devotee of tobacco who was rendered dangerously ill from masticating the foil with which his favorite weed was enclosed. To obviate such difficulties, the lead is now made in a separate sheet and placed between two leaves of tin. The whole is then rolled together, so that while the inside of the foil contains the cheap and injurious metal, the exterior, which comes in contact with the substance enveloped, is devoid of bad effects.

Pure tin foil is in use, though in a limited number of cases. Large sheets of it are employed in the manufacture of mirrors; these, of course, are extremely thin. Another variety, of not over $\frac{1}{1500}$ of an inch in thickness, is "white Dutch metal," used for ornamentation in theatres and for other purposes in which silver foil would be too costly. Dentists occasionally fill teeth with a quality somewhat thicker than the foregoing, as it packs with nearly as much readiness as gold. Lastly, pure tin is used in those soft tubes in which artists' pigments are contained. For this purpose tin is better than silver, as it has no affinity for sulphur nor is it affected by any oxidizing ingredient which the paint may hold in composition.

Ordinary foil made, as already described, of tin and lead is valuable for enveloping any material from which it is desirable to exclude the air. It is generally used in its different varieties to enclose cocoa, chocolate, spices, druggists' preparations, corks of wine bottles, etc, though it is most largely employed as wrapping for chewing tobacco, one manufacturer in this city (Lorillard) alone consuming some 20,000 pounds per month. Sign painters find a use for it in making a kind of fancy sign, the leaves being placed behind letters traced on clear glass, producing the effect of inlaid mother of pearl. This, however, is a probable imitation of Chinese lacquering, which is done on a groundwork of the same material.

In the market, three varieties of tin foil are found. Of these, tobacco foil is the thickest and cheapest (probably because it contains the most lead), selling at wholesale for 23 cents a pound. No. 2 foil, generally used by druggists, is the next quality, the price being 32 cents, while the thinnest variety is tissue foil, at 40 cents a pound. A great portion of that used in this country is necessarily imported, as there is only one manufactory now engaged in its production in the United States.

AS AN accompaniment to the Grand Jubilee at Boston, Professor King, of that city, is manufacturing a gigantic balloon, capable of carrying fifteen or twenty passengers. This great flyer is to be called the "Colossus."