Correspondence.

Wind Pressure.

To the Editor of the SCIENTIFIC AMERICAN:

A recent number of the SCIENTIFIC AMERICAN, in an editorial on Sir T. W. Barry's remarks, at the meeting of the British Association at Bristol, anent the want of agreement between the results and conclusions of experiments on a small scale and the working of nature on a more extended basis, alludes to the fact, among others, that as far as wind pressures are concerned, while at the great Forth Bridge in Scotland 58 pounds to the square foot were allowed for, based on the indications of ordinary anemometers, the result of an experiment on a 300 foot surface under like conditions showed a falling off of very nearly 40 per cent. Again, at the Tower Bridge, London, while conclusions based on anemometrical readings indicated a pressure of 6 to 9 pounds per square foot, experiments conducted on the bascules of the bridge, whose area is 5,000 feet, showed only from 1 to 1½ pounds wind pressure under absolutely similar conditions.

These glaring differences are accounted for on the assumption that a gale of wind presents areas of maximum pressure which are far in excess of the average pressure. Now, I am in a position to say that this mere surmise of the editor of the SCIENTIFIC AMERICAN is a matter of fact; and to proof: While in a gale, at Quebec, the mere galvanized iron roof sheeting of four of the octagonal kiosks on Dufferin Terrace remained untorn, which it had been on other occasions of severe gales, the fifth kiosk, situated in the midst of the other four, not only had its sheeting curled up and twisted and torn off, but the entire roof framing, all of cast iron and bolted together, was bodily wrenched from its eight supporting columns, the confining bolts of each of which were broken off, and the whole roof, some 2½ tons in weight, carried up a height of say 40 feet and over a distance of some 300 feet and deposited in a broken and demoralized condition on the glacis in rear of the terrace.

Now it is evident that in this case there was, within the general stream of easterly wind blowing up the St. Lawrence and striking the terrace, an intensified current which struck the demolished structure—a stream within a stream, so to say, as with the Gulf Stream in the ocean. I reduced the thing to figures at the time (some ten years ago or less), and found that while the anemometer at the Quebec observatory, on the occasion, indicated only 59 pounds, the stress on the roof of the kiosk, thus to tear it away and hurl it to such a distance, must have had a cyclonic force of not less than 100 to 120 pounds to the square foot.

The same thing occurred in the United States a few years ago, when, as I then showed in a letter on the subject, published in The Engineering Record, of New York, while the general go of the wind storm was insufficient to do the mischief, there must have been within the moving river of air, the rush of air in motion, a more intensified stream, which struck and overthrew two of the 500 foot spans of the Jeffersonville Bridge, each of which weighed not less than 1,000 tons.

But this does not explain nor in any way account for the difference, hereinabove alluded to, of the effect of wind currents on areas of varied extent. I think, Mr. Editor, I can account for this. It will be remembered that I was the first at the time, or for some months after the attention of the world at large had been called to the apparent paradox, to explain the so-called ball nozzle mystery, which I did by showing that the issuing circumferential jet of water carried with it by friction the water in the rear of the ball, thus creating a vacuum against which the pressure of the atmosphere reacted to keep the ball in place.

Now precisely the same thing happens with the anemometer, and the more so the larger its surface or extent. The wind, passing around its periphery, sucks out the air from in rear of it, creating a vacuum against which the atmospheric pressure on the opposite side reacts.

It will be noticed that, while in the case of the Forth Bridge, as set forth, the larger area of experimentation, 300 feet, gave a wind pressure of only 40 per cent less than that indicated by the ordinary anemometer, in the case of the Tower Bridge, the 5,000 feet area of the bascule experimented on reduced the anemometrical pressure of from 6 to 9 pounds down to from 1 to 1½ pounds, or not only by 40 per cent, but by 600 per cent, this difference being due to the proportional circumferential or linear peripheries of the surfaces experimented on, in comparison with the areas at play, the peripheries varying only as the linear dimensions, while the areas varied as the squares of those dimensions.

For instance, if the anemometer were a foot square, its area would be but 1 foot, while its periphery was 4 feet; or the area to the circumferential dimensions in the proportion of ¼ to 1. With a surface of 10×10 feet, the area would be 100 feet and the periphery 40, or area to circumference as 2½ to 1. Again, if the surface played on by the wind were 100×100 feet, the area would be 10,000 square feet, while the periphery was only 400 feet, or the ratio of area to circumference that of 25 to 1, leaving the wind to act on or around edges of 4, 40, and 100 feet respectively, while the atmospheric pressure was exercised against areas of 1, 100, and 10,000 square feet, and thus explanatory of the fact that the greater the area acted on, the greater the reduced percentage of pressure indicated by the larger surface.

CHARLES BOELLARGE, Consulting Engineer.

Quebec, October 7, 1898.

The German Toy-Industry—Its History and Development.

Although the little Thüringian town of Sonneberg, the center of the modern toy-industry, says Uhland's Wochenschrift, is commonly considered as the birthplace of toy-making, it cannot be denied that the first attempts in the art were made by the village of Judenbach, situated further to the northeast. By reason of its favorable situation near the Nürnberg-Sächsische Geleitsstrasse, a road much frequented ever since the thirteenth century, and the only means of communicating with Leipsic and Nuremberg, the village could always readily dispose of its crude wooden, house and kitchen utensils, and later, of its little chairs, tables, animals, cross-bows, swords, guns, and musical instruments.

Even long after the art of making wooden ware had been introduced in Sonneberg, Nuremberg was still the market for these peasant-products and continued to make the most by the transaction. Not without reason did the city call Sonneberg its Goldtöchterlein (little gold-daughter). Not until the Thirty Years' War had destroyed all the regular trade-communications, did the Sonneberg tradesmen themselves begin to travel about with their wares. The inhabitants of Judenbach, on the other hand, could never conclude to leave their native village in order to sell their products. While in Judenbach the toy-industry did not attain great proportions, in Sonneberg, the trade, as early as the seventeenth century, had grown to such an extent that, when public markets were established in Frankfort-on-the-Main, the merchants of Sonneberg were granted equal exemption from taxes and duties with the merchants of Nuremberg.

Till the eighteenth century, toys were colored with poisonous bismuth paints. An important step in the development of the industry was the endeavor to make those parts which were with difficulty carved of some doughy substance (rye flour mixed with lime water). But this substance softened and mildewed when moistened. A decided advance can therefore be recorded only when Friedrich Müller, a citizen of Sonneberg, began to use papier maché, a substance of which he had heard from a French soldier. The figures were no longer modeled as before, but the plastic mass was now pressed into shape by moulds. By means of this new substance Sonneberg produced its wares with almost mechanical rapidity. Toys were no longer made in the houses of peasants, but in factories. The cost of these new wares was, moreover, considerably reduced—a most significant factor in the manufacture of toys.

Strange to say, in the making of dolls but little progress was made. Not until a new method was introduced into Sonneberg, which came from China, by way of England, can any great improvement be recorded. From the first Chinese dolls of 1852, with their movable limbs strung together by cords drawn through the joints, developed the so-called "jointed dolls." In coloring the faces of these dolls, white lead, a poisonous paint, was long employed, until, by legislative action, its use was prohibited. Nowadays the innocuous zinc oxide and similar harmless colors are used. The hair of dolls, after many failures with other material, is now made of mohair and the fur of Angora goats.

In this manner the toy-industry slowly developed to its present state. How numerous are the varieties of toys now made may be inferred when it is considered that the design room of a Sonneberg factory contains from twelve to eighteen thousand designs.

In order to maintain the position which they have reached, toy-makers are compelled constantly to bring forth new models and to adapt their products to the tastes and peculiarities of foreign purchasers. Years ago, the chairman of the Sonneberg Chamber of Commerce and Industry proposed the collection of toys made by foreign manufacturers, in order that Sonneberg toy-makers might thus be able to acquaint themselves with the wants and peculiarities of foreign markets. Such a collection of models has now been made and does good service for the manufacturers, as well as for the students at the various industrial schools of Thüringia.

The toys at present made may be divided into the following groups: 1. Wares made entirely of wood, such as cross-bows, guns, violins, flutes, chess and draught boards, rattles, jumping manikins, nut-crackers, soldiers, ninepins, rocking horses. 2. Articles made mostly of wood, such as doll-houses, kitchens, shops, furniture, Punch-and-Judy shows. 3. Mechanical toys. 4. Papier maché articles, such as harlequins, riders, caricatures of national types, animals covered with felt or leather, shepherds' houses, menageries, figures of Santa Claus. 5. Animals covered with fur. 6. Metal toys, such as tin figures, toy trumpets, weapons, and theaters. 7. Figures and toys made of china, burnt clay, stone, and glass. Among these toys may be mentioned toy dishes, marbles, and articles of various kinds made of blown glass. 8. Christmas tree decorations of glass, metal, and wax. In Lauscha wax is the material most used. 9. Dolls with appurtenant wagons, chairs, and swings.

Besides Sonneberg, the towns and villages of Watterhausen, Friedrichsroda, Ohrdruf, Ilmenau, Hildburghausen, Schleusingen, and Coburg are engaged in the industry. Toy-factories are now scattered more or less over half of Germany; they are distributed from the Black Forest and the Palatinate to the Sudetic Mountains and the province of Brandenburg. Of particular importance are the Erzgebirge of Saxony, which, on account of their forests and abundant water-power, have enabled the manufacturers of Saxony to produce many of the more common toys formerly made in Sonneberg.

The most recent statistics show that Germany has exported 40,500,000 marks' ($10,125,000) worth of toys, while in 1895 but 30,000,000 marks' ($7,500,000) worth were sent abroad. Including the toys sold in Germany, the product of the entire German industry is probably worth 50,000,000 marks ($12,500,000), from which 750,000 marks ($187,500), representing the value of toys imported from foreign countries, must be deducted. Sonneberg undeniably produces half the toys made in Germany. The two largest buyers of German toys are the United States and England. Last year, the United States imported German toys to the value of 11,000,000 marks ($2,750,000), England to the value of 17,000,000 marks ($3,750,000). Of the products exported to the United States, 6,500,000 marks' ($1,625,000) worth were supplied by Sonneberg. A similar proportion holds good for England. To the development of toy-manufacture and to the rise of doll-making is due the increase in the number of export houses in Sonneberg. In the sixties there were about thirty export firms. By 1880 the number had increased to forty-eight and by 1896 to seventy. According to the latest statistics, there are 40,829 persons engaged in German toy-manufactories, of which number 44 per cent are employed in Sachsen-Meinigen. In the region about Sonneberg about 34 per cent of the population are engaged in toy-making, not including those who, in addition, are otherwise employed.

Luminous Sugar.

There are phenomena attending the formation of crystals which are apparently quite distinct from chemical action, says The Lancet. When, for example, a hot saturated solution of arsenious acid is allowed to cool, the act of crystallization is accompanied by a flash of light. As each crystal forms there is a short, sharp glow, indicating the release of a certain amount of latent energy in the form of light radiation. A related phenomenon would seem to be the case when two pieces of cane sugar are quickly rubbed together. The flash is perfectly distinct and bluish-white in color, the light extending into the substance itself far below the surface. Some interesting experiments on this manifestation have recently been made by Mr. John Burke, M.A., the results of which were communicated to the recent meeting of the British Association of Science at Bristol. By mounting disks of loaf sugar on a lathe and projecting a hammer on the rotating surface an almost continuous luminosity was obtained. The wearing away of the sugar is compensated for by arranging a gradual approach of the piece to the hammer in exact accordance with the amount of sugar scraped away. In this way the spectrum has been observed and photographed. From these observations it would appear that the luminosity cannot be due to the particles of sugar becoming red hot or white hot by the impacts, the indication being that the light produced is due either to some change in the configuration of the crystals of sugar or to some sort of chemical action set up between the sugar and the surrounding air at the freshly formed surface. The fact, however, that the surrounding medium does not seem to affect either the color or intensity of the luminosity suggests that the effect is not due to any influence of a chemical nature of the surrounding medium on the sugar, but favors the former hypothesis that the luminosity is due to some structural disturbance in the sugar itself. This ingenious and pretty study is being pursued further and the result should lead to some interesting observations. Light is so often a manifestation of physical change that it is probable some day we shall derive it for illuminating purposes in a totally different, much simpler, and less clumsy way than obtains at present.

A. GAUTIER finds that free hydrogen is a constant constituent of the atmosphere: it is only present in very minute quantities, from 11 to 18 c. c. in 100 liters of air, or on an average about 0·015 per cent by volume. Its volume is, therefore, nearly one-half that of the normal amount of carbonic anhydride present in pure air.—Comptes Rendus, cxxvii., 694.