Niagara Falls Hydraulic Power and Manufacturing Company on the New York side. This latter company, however, carries its water to the edge of the high bank of the gorge through a surface canal, whereas the Ontario Power Company will conduct its water supply from the upper river, through the park, in large pipes, but whether they will be of wood or steel is not yet stated. The company will have its power station in the gorge, a short distance below the Horseshoe Fall, where a large force of men has been at work several weeks excavating the debris slope of the bank.

It is the Ontario Power Company that has constructed the immense wing dam out in the river above the Dufferin Islands. This wing dam is nearly 800 feet long, and already it has had the effect of diverting the waters of the river to such an extent, that a large area of the river bed between the dam and the Falls has been laid bare. The depth of water over this portion of the river was always inconsiderable, and the interference with the current by the dam easily produced the large area of dry river bottom shown in the accompanying photograph. It is interesting to note the curiously rounded appearance of the rocks resulting from the age-long attrition of the rushing waters.

THE MANUFACTURE OF TOYS AND DOLLS.

In a quarter of New York's "East Side," imbued with the half-European, half-American atmosphere so characteristic of Bohemian, Hungarian, and Polish settlements in America, a toy factory is situated which furnishes the children of our Eastern States with cheap, gayly-colored playthings. The factory, industrially considered, is a picturesque combination of modern labor-saving and old-fashioned labor-employing methods; for the most ingenious machinery and the simplest form of hand labor work side by side. There are some things that machinery can never do; and for that reason the factory girl cannot be dispensed with —in a toy-factory at least.

Historically considered, the toy industry may be said to have begun in Nuremberg. The development of the industry that made the old town so famous may be easily traced in the collections of the Germanic Museum. There completely furnished doll-houses, with cellars, vestibules, staircases, servants' quarters and drawing-rooms, are set up, and faithfully represent the home life of olden times. The old mechanical toys which are here to be seen are the work of locksmiths; for besides working at his trade the Nuremberg locksmith made many a clever toy. Tinkers opened a new field for the toy industry by the introduction of optical instruments, such as magic lanterns, and of magnetic toys, ships and swimming animals. The use of steam power and later of electricity gave the industry another impulse.

From roof to cellar the interior of the New York factory referred to is a chaos of flaring color. Paint—red paint, green paint, yellow paint, paint of all possible hues—is spread with lavish hand on the tin. The factory girls are besmeared with it; every floor reeks with it.

The tin used in making the toys is purchased in large sheets. By treadle-operated shearing machines fitted with reciprocating-knives the sheets are cut into strips or pieces of various sizes and shapes. Some of the sheets are embossed with designs, and are then passed through the paint-covered rollers of a painting machine, by which the embossed surface is coated and the intaglio left in its original bright metallic condition. These embossed and colored sheets are variously utilized in the making of kitchens, seashore-sand pails for boys and girls, shovels, comb cases and the like.

From the shearing-floor the cut sheets are taken to another floor to be stamped into various forms or "pressed," as it is technically called. The presses used comprise each a substantial frame with a horizontally mounted shaft connected by a crank with a plunger carrying a die. With but a single downward movement of the plunger a piece of metal is given any desired shape. Kitchen utensils such as cups, saucers, plates, dishes and the thousand and one articles that are made in a toy-factory are stamped out by these machines. Many of the products are taken to another room and turned in order to remove the jagged edges.

Besides the presses peculiar forming-machines are used which are of exceedingly simple construction, and which serve the purpose of forming tin tubes from long strips of metal, and of crimping the edges of various utensils. The tube-forming machines consist primarily of a table having a semi-cylindrical groove, and of a plunger carrying a die the length of the semi-cylindrical tube. By dextrously manipulating a long strip of tin, an operator causes the die to force the strip into the groove, in order to form a perfect cylindrical tube.

After the various articles have been made by the presses and forming machines, they must be painted. For that purpose they are turned over to girls who apply the color by brush. No machine could possibly perform this work; for the girl must know exactly where the color is to be applied and how to apply it. Almost every toy that is made must eventually pass through the hands of the painters. Railway cars are striped, kitchens are ornamented, horns are encircled with bright bands, and horses are given colored coats and furnished with painted harnesses. The painted toys are dried in a special steam-heated room.

Many of the toys either before or after they have been painted are turned over to men whose duty it is to rivet in their places parts which cannot be applied by machinery. Railway cars, for example, must be furnished with wheels. Certain workmen are therefore supplied with miniature axles upon which a single wheel is rigidly secured at one end. The axle is clamped in a vise; the car bearings are slipped over the axle, and the remaining wheel placed in position and riveted with a few taps of the hammer. Similarly, horns must be furnished with sound-producing means. For that purpose solderers are employed, who are furnished with small brass reeds, which are leaded in place at the mouth-end of the horn and covered with wooden mouthpieces. The horns after having been equipped with their reeds are tested. If the reed has been improperly applied, the error is corrected. Some of the toys, as for example human figures, must be dressed, and are therefore passed to girls, who sew the garments on the tin bodies.

Mechanical toys, which, at one time, were almost exclusively made in Germany, are also produced in this New York factory, though in limited quantities, to be sure. Many of these toys are ingenious pieces of mechanism and comprise interesting mechanical movements. Without exception the mechanical toys are all driven by clock-trains, the escapement of which is so mounted as to produce the peculiar effect desired. By an ingenious arrangement of the escapement and the clock-train, miniature drunkards are produced, with reeling walk, maudlin nodding head, and absurdly moving arms, which simulate an attempt to fill a glass held in the one hand from a bottle held in the other. A fiddler who industrially saws away, without, however, producing any sounds, is another interesting mechanical toy. But perhaps the funniest of all these mechanical playthings is the so-called "balking mule," which represents a clown seated in a cart drawn by a rather refractory mule whom he seeks to control by rocking himself forward and backward, and violently jerking the reins. The toy is so constructed that the mule gallops forward for a few paces and then backward with equal rapidity for the same distance—all apparently the result of the frantic efforts of the clown to stop him.

In another New York factory situated in the heart of the business district, dolls are made; not China dolls, but dolls that can be dropped upon the floor without breaking. The process of manufacture on the whole is decidedly simpler than that of making metallic toys. The steps are few and simple. A peculiar composition is poured hot into a mold to form the head, arms, or feet. After the portion thus cast has cooled, it is removed from the mold and passed on to workmen, who pare off the seams and jagged edges by means of knives and smooth the surface with sandpaper. The eyes, which are specially imported from Europe, are then inserted through the neck into the sockets. Other operators thereupon paint in the eyebrows and hair and tint the cheeks. The more expensive dolls are provided, not with painted hair, but either with artificial hair of jute or with real hair.

The bodies of the dolls are merely stuffed sacks with extensions upon which the arms and legs can be sewed. After the entire doll has been completed, it is dressed in clothes varying in splendor with the price of the doll.

The Need of a Safe Match—A Chance for Inventors.

At a meeting of about forty manufacturers and dealers, called at the suggestion of the Fire Commissioner of New York, to consider the possibility of finding a match that would be safe to use, it was stated that the safety match is in reality no safer than the parlor match. If this be true, there is not much to be gained by the law prohibiting the sale of parlor matches. There seems to be here a chance for some inventor of a chemical turn of mind to use his ingenuity in designing a match which shall be safer than the matches at present in use, and shall not entail any danger in its manufacture.

Award of the Nobel Prizes.

The Nobel research prize of $40,000 has been awarded to Major Donald Ross, of the Liverpool School of Tropical Medicine, in recognition of his investigations into the mosquito-malaria theory. Three other Nobel prizes were awarded, as follows: Natural science and chemistry, Dr. Emil Fischer of the Berlin University; physics, Dr. Arrhenius of the Stockholm High School; medicine, Dr. Finsen. Each prize is worth 160,000 marks.

Correspondence.

The Effect of Light on Animal and Plant Life.

To the Editor of the Scientific American:

I note with interest a very able article in your last issue, by Dr. James Weir, Jr., in which he describes the effect of light on plant and animal life, with but one probable error, which I shall endeavor to point out. He says among other things:

"Flammarion's beautiful experiments at the climatological station at Juvisy have shown beyond question of doubt the widely different effects of the red and violet rays on plants. The plants chosen were of the genus Mimosa, or "sensitive plant," and were subjected to the same environments with the exception that some were reared beneath dark blue glass, and others beneath red glass.

"In four months the plants grown under the red glass had attained extraordinary development. while those subjected to the violet rays had made no progress whatever. Similar effects were noted in the case of strawberries, and numerous other plants, vines and shrubs.

"The plants grown beneath blue glass did not die, but seemed to remain in a dormant condition, without growth or further development. Zacharawietz, of Vaucluse, has also shown that plants are strongly affected along the lines of rapid growth and development by red and orange rays. As early as 1883 I demonstrated and published the fact that typhoid fever germs would not live when subjected to the blue or violet rays."

From the foregoing one gets the impression that plants under a red glass are subjected to red rays of light, while the reverse must be true, as the red glass has absorbed all the red rays of light, and the remainder only have penetrated.

Who has not observed that in a photographic dark room, where a red light is used, anything therein which is red will appear white, for there are no red rays in the room, all being absorbed by the red paper through which the light is filtered.

E. Ritchison.

Modale, Iowa, November 22, 1902.

Koch's Last Communication.

At a recent meeting of the International Tuberculosis Congress, Prof. Koch reiterated all that he said regarding the non-transferability of animal tuberculosis to man. He asserted that statistics on the subject of intestinal tuberculosis were too incomplete to establish the frequency of that disease. Although he admitted that cases of tuberculosis do occur among butchers and other persons who handle animals, he asserted that the percentage of sufferers from the disease among joiners is equally as high as among handlers of animals and meat. Experts state that large amounts of tuberculous meats are consumed, and that not only the flesh, but even the tuberculous organs are made use of for food, yet no widespread infection follows. Prof. Koch declared that only two cases of alleged general infection were known to him, and that these two were not proved.

Shipment of the 16-inch Rifled Gun.

The 16-inch rifled gun built at Watervliet for the United States Government, has been shipped to Sandy Hook. The railroad companies feared to transmit the 130-ton gun over their roads and refused transportation, by reason of the great strain which it would impose upon their bridges. A New York dredging company made a contract with the company to transfer the weapon from Watervliet down the Hudson River from Troy to Sandy Hook. The price for this service is said to have been $5,400. The gun was placed on a specially-built car and run to the river front. There the gun and car were lifted onto a barge by means of a 250-ton derrick. At Sandy Hook the wharf was strengthened to receive the big gun.

The Current Supplement.

In the current Supplement, No. 1405, the description of the Langley aerodrome is concluded. Certain improvements in methods of quarrying slate are published, which are well illustrated. Francis J. Fitz-Gerald discusses exhaustively the subject of the conversion of amorphous carbon into graphite. An article on long spans for overhead electric cables is a subject which, at a time when the transmission of electrical currents over long distances is being more and more developed, should be read with some little interest. Mr. Kittredge concludes his discussion of the utilization of wastes and by-products in manufactures. Prof. Dr. von Bezold tells much that is interesting of the upper atmosphere. Archæologists will find published for their special benefit an account of the recent discoveries of the Italian mission in Crete, and an article by Eduard Seler on Prehistoric Civilization in America. V. de Turine describes photophonic books for the blind. The usual number of Selected Formulæ, Consular Notes and Trade Notes are also published.

Exposition of Hygienic Milk Supply.

The U. S. Department of Agriculture has received through the Department of State notice that a general exposition of hygienic milk supply will be held at Hamburg from May 2 to May 10, 1903. The exposition will embrace eight sections as follows:

Section A.—For milk production: (1) Exhibit of limited number of milch cows of known race; (2) stable fittings and implements; (3) regimen and hygienic food; (4) technics of milk, tests, and execution of; (5) management of milk in stable and pastures; (6) personnel of milking and stable (clothing, health and supervision of the same).

Section B.—Veterinary control of the condition of milch cows and of milk: (1) Legislation; (2) management of contagious outbreaks (with demonstration); (3) diseases of milch cows; (4) special diseases; (5) unwholesome food plants and drinking water; (6) secretion through the milk of medicinal stuffs; (7) sanitary management; (8) disinfection of stalls (means and apparatus).

Section C.—Conveyance of milk, land and waterways, railways; conveyance and distribution in cities; (2) cleansing, spinning, cooling, Pasteurizing, sterilizing and concentrating (condensing) milk; (3) arrangements for measuring and weighing; (4) cleansing apparatus for flasks; (5) machinery for bottling, pouring and sealing.

Section D.—Exhibit of management and sale of milk (wholesale and retail trade), with complete furnishings.

Section E.—Milk legislation and administration: (1) Laws, ordinances, decrees and judgments; (2) police supervision of milk traffic (removal, previous examination, preserving, conveyance); (3) chemical and bacteriological inspection; (a) model laboratory, working; (b) instruments and tools for laboratory.

Section F.—Scientific: (1) Means of instruction with scientific demonstration; (2) scientific instruments and tools for milk laboratories; (3) literature, statistic and graphic exhibitions.

Section G.—Milk preparations: (1) Condensed and prepared for long keeping for use in the army and navy; (2) milk for infants; (3) for therapeutic purposes; (4) other foods and preparations produced from milk.

Section H.—Machinery and apparatus for the treatment of milk in the household.

Intending exhibitors should make application for space to the Geschäftstelle in Hamburg, 6, Kamp Strasse 46.

"The Land of Unbounded Possibilities"—A German Economist's View of the United States.

Herr Ludwig Max Goldberger, of Berlin, Royal Privy Councilor of Commerce and Member of the Imperial German Consultative Board for Commercial Measures, recently made an eight months' official tour of the United States for the purpose of observing the industrial developments in this country from a commercial and economic standpoint. His articles were contributed to the German weekly, Die Woche, under the general title, "The Land of Unbounded Possibilities," from which the following are extracts:

"The United States, like an enchanted garden, has brought forth from a marvelously productive soil splendid results of human ingenuity. Yet the thing that causes most wonder is that the concentrated intelligence which, intending to replace human factors by machinery, has, in working toward its aim, been giving to constantly growing numbers of workmen an opportunity to support themselves and become productive factors. The joy at the size of their own land encourages each individual. It makes him communicative and friendly to foreigners who are seeking information. It seems as though everyone were filled with the idea, 'The stranger shall see how great and strong America is.' My eight months' trip of observation and study took me through the States, and everywhere I found open doors inviting me to enter, and nowhere did I find the slightest attempt at secretiveness. Everywhere I observed an uncommon but steady bustle of men who enjoy their work and are consciously working for great results. 'It is a great country.' This is the verbatim designation of reverential admiration which the citizen of the United States has found for his country.

"The inhabitants of the United States, including Porto Rico, Hawaii and the Philippine Islands, number about 88 millions—that is, barely 5 per cent of the world's total inhabitants, according to its highest estimate. This 5 per cent has at present taken possession of 25 per cent of all the cultivated area of the earth, viz., 407.4 million acres out of 1629.3 million acres. A land of marvelous fertility offered itself for tillage, and the husbandman had but to gather in the produce. The virgin soil made his work easier, and its extensiveness rendered the application of artificial fertilizers practically unnecessary, although the agricultural offices of the States and the Union have constantly by excellent advice and practical expert assistance been furnishing the ways and means toward more intense cultivation.

"Let us examine the corn crops for the six years, 1895-1900. The world's total product fluctuated between 2.6 and 3 billion bushels per annum, a total of 16.6 billions for the period with an annual average of 2.77 billions. Of this amount the United States alone produced 12.4 billions, an average of 2.07 billion bushels per annum, or 75 per cent of the world's crop.

"Toward the world's wheat crop the United States contributed in the five years 1896-1900, 20.7 per cent, while for the year 1901 its contribution to the world's production of wheat amounted to 25 per cent. During the years 1896-1900 there were grown 14.7 billion bushels of oats in the world, and of this 3.74 billion bushels, or 25.5 per cent, were produced by the United States.

"In the production of iron ore the United States proved itself to be a veritable land of unbounded possibilities. It produced very nearly 36 per cent of the total iron ore produced, and that of the very best quality. In the past year the United States produced 39.3 per cent of the world's product of pig iron. In 1900 it produced roughly 10.1 million tons of steel, or 42 per cent of the world's product, and in the year 1901 the United States output was increased to 13.5 million tons.

"The United States produces nearly 55 per cent of all the world's copper. The development of the American copper industry was perhaps more rapid than typical for even American changes. From modest beginnings this industry grew by leaps and bounds in a remarkably short time to the most important factor in the world's production. In 1870 the copper production of the United States amounted to 12,000 tons; in 1880 its production had increased to 27,000 tons out of a total world production of 153,000 tons; in 1890 the United States produced 116,315 tons of the world's product of 269,455 tons. During 1895 it controlled more than one-half of the world's production, and at the end of the century the United States produced 270,000 tons, or more than the world's entire product had amounted to ten years before.

"The output of lead in the United States since 1895 has increased to such an extent that it has wrested from Spain the position of primacy in the world's production. In 1900 the United States produced 29.6 per cent, while Spain's share had receded to 18.7 per cent. In 1901 the United States increased its production of lead to 250,000 tons.

"The rivalry of the United States in the production of quicksilver has been equally strenuous. In 1900 for the first time Spain's product is slightly exceeded by that of the United States. In 1901 Spain's share in the world's product amounts to but 28 per cent, while the United States furnishes 33 per cent of the world's total product.

"The total world's production of gold for the year 1900 was estimated to be 255.6 million dollars; that of silver represented a coinage value of 223.5 million dollars. For the year 1901 estimates for both metals amount to 265 million dollars. In each of the two years the United States showed the greatest share of both metals, 31 per cent for gold and 33 per cent for silver."

Prof. Trowbridge's Experiments with Gases Subjected to Very High Temperatures.

In a communication to the Electrical Review, Prof. Trowbridge states that his study of gases produced by powerful discharges from condensers charged by a storage battery of from 10,000 to 20,000 cells, has now reached its limit. The glass vessels containing the gases volatilized under the effect of the discharges, and after one or two discharges cracked under the effect of the great heat. During the past summer he obtained in London suitable vessels made of quartz, which can be heated to a white heat without cracking, even if, while at this heat, they are plunged into cold water.

For this purpose Geissler tubes were made—four or five inches long—with a capillary portion of two inches in length.

In this capillary part the electric discharges produce the most intense light that has ever been studied, Prof. Trowbridge believes, in a laboratory. In its photographic effect it is at least four times that produced by the same amount of electrical energy discharged between magnesium terminals.

The result of Prof. Trowbridge's study of this light reveals the presence of both bright and dark lines in the ultra-violet portion in the spectrum of hydrogen or water vapor. The dark lines have never been seen before. They are due to a selective reversibility or selective solarization of the lines of the gas.

An American tender to install underground telephones in the city of St. Petersburg for 315,000 rubles has been accepted. The tender was on lower terms and easier conditions of payments than the offers of other bidders for the work.

Electrical Notes.

The Sheffield, England, electrical engineer, Mr. S. E. Fedden, gives some interesting figures relating to the use of steam turbines for electrical power generation in a paper read recently before the Municipal Electrical Association. From a table of actual tests of a 500-kilowatt turbo-alternator running at 2,500 revolutions per minute and with 140 pounds steam pressure at the stop valve, it appears that the consumption of steam per kilowatt hour at full load varied between 22.2 pounds to 28.9 pounds. The former consumption was obtained with a vacuum of 28 inches and the latter with 22 inches in the condenser. An economy of 8 per cent in steam consumption was obtained with 50 deg. superheat and 12 per cent with 100 deg. superheat.

Interesting experiments have been conducted by Dr. Lemstrom of Helsingfors University on the effect of an electrical discharge on the growth of plants. Four seeds of barley, wheat and rye were sown in pots, the soil being electrically connected with the ground. Above the two pots was suspended an insulated network of wire with a number of points of a Holz machine so connected that in some of the pots the electric current passed from the metal work to the earth, while in others it passed in the reverse direction. For five hours daily a current was passed through the soil. After eight weeks the height of the plants affected by the electric current was found to be about forty per cent greater than those to which no current had been applied. It is said that experiments with other plants show similar results, but different in degree.

The option held by the Continental Trust Company to purchase the common stock of the United Electric Light and Power Company and the stocks and bonds of the Mount Washington Electric Light and Power Company was exercised on November 15. The syndicate will secure power from the Susquehanna River. The introduction of electric power derived from the force of the Susquehanna River will have a vast influence on the manufactures of Baltimore. It is estimated that the cost of lighting the city can be reduced to about $20 per year per lamp, if the city maintains its own distributing plants. It now costs the city $99.12 for each arc lamp under a contract which expires in September, 1905. It is hoped that the industrial growth which accompanied the introduction of electric power at Niagara Falls will find a parallel at Baltimore. Plants of 50,000 gross horse power are planned.

Rear-Admiral R. B. Bradford, Chief of the Naval Bureau of Equipment, has recommended to the Secretary of the Navy that the government secure control of all wireless telegraphic stations on the coast of the United States. Unless this is done, Admiral Bradford believes that there will be interference in the transmission of wireless messages between stations of private companies within the same circuit. Foreign governments are exercising careful supervision over the location of wireless stations for strategic reasons. Admiral Bradford in his report states that he had not been able to arrive at any satisfactory conclusion with the Marconi Wireless Telegraphy Company, for the reason that he can obtain instruments only on the payment of royalty. He states that most naval powers are far in advance of the United States in the installation of wireless telegraphic appliances on board naval ships, but he believes that no ground has been lost by reason of the slow progress made.

A new process for making incandescent lamp filaments has been invented by M. de Marc, of Brussels. His object is to form a core of magnesia upon which is deposited a layer of carbon, thus giving a filament which has a greater mechanical resistance than the ordinary carbon filament. To obtain the core, a mixture of magnesia, tar and powdered carbon is made and the pasty material is formed by high pressure into filaments or bands of the proper diameter. The filaments are then heated in a gas furnace at a high temperature in order to solidify them and produce a partial combustion. After coming from the furnace the filaments are very hard and resistant. They are then placed in a chamber in rarefied air or a gas containing oxygen and a weak current is sent through them in order to produce a combustion of the carbon and leave only the magnesia which forms the base of the core. In fact the carbon begins to burn at the exterior and the combustion proceeds toward the interior of the filament, while on the surface is formed a solid layer of magnesia. After this preliminary treatment they are burned in free air until all the carbon is consumed. In this way a small tube of pure magnesia is obtained, which is then to be coated with carbon to form the lamp filament. For this it is treated by a flash process like that of a carbon filament, in an atmosphere of hydrocarbon gas and the filament when raised to incandescence receives a deposit of carbon on the surface. Thus prepared, they are mounted in a bulb to form the lamp. The inventor claims that the lamps formed according to this process have a great mechanical resistance.