Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year..... $3 00
One copy, six months..... 1 50
CLUB RATES { Ten copies, one year, each $2 50..... 25 00
Over ten copies, same rate, each..... 2 50

VOL. XXIX., No. 11. [NEW SERIES.] *Twenty eighth Year.*

NEW YORK, SATURDAY, SEPTEMBER 13, 1873.

Contents.

(Illustrated articles are marked with an asterisk.)

END OF THE VIENNA PATENT CONGRESS.

The labors of this body were brought to a close on the 5th ult., after debate on the resolution mentioned in our last issue. The recommendations given below were adopted by a vote of 74 to 6. It will be noticed that the resolutions cover little more than is contained in the existing patent laws of the European States. The conservative, narrow-minded policy appears to have predominated among the members, who were evidently unable to appreciate the wants of inventors, or give expression to liberal and progressive sentiments concerning the value of inventive labors. Some of the reasons given in support of the adopted resolutions are peculiar, if not erroneous. The last and best thing done by the Congress was to appoint a committee to choose members and convoke a second Congress. Let us hope that the new body will be more competent to deal with the subject. The following are the resolutions in full.

"RESOLUTION I.—The protection of inventions is to be guaranteed by the laws of all civilized nations under the condition of a complete publication of the same, because:

a. The sense of right of civilized nations demands the legal protection of intellectual work.

b. This protection affords the only practical and effective means of introducing new technical ideas, without loss of time and in a reliable manner, to the general knowledge of the public.

c. The protection of invention renders the labor of the inventor remunerative, and induces thereby competent men to devote time and means to the introduction and practical application of new and useful technical methods and improvements, or to attract capital from abroad, which, in the absence of patent protection, will find means of secure investment elsewhere.

d. By the obligatory complete publication of the patented invention, the great sacrifices in time and of money, which the technical application would otherwise impose upon the industry of all countries, will be considerably lessened.

e. By the protection of invention the secrecy of manufacture, which is one of the greatest enemies of industrial progress, will lose its chief support.

f. Great injury will be inflicted upon the countries which have no rational patent laws by the native inventive talent emigrating to more congenial countries, where their labor is legally protected.

g. Experience shows that the holder of a patent will himself make the most effectual exertions for a speedy introduction of his invention.

RESOLUTION II.—An effective and useful patent must have the following principles:

a. The inventor or his legal heir only can obtain a patent. A patent cannot be refused to a foreigner.

b. In order to carry out the principle stated above (*a*), the introduction of the system of a preliminary examination is recommended.

c. A patent for an invention should be granted for fifteen years, or the option should be to extend it to that period.

d. The granting of a patent must be accompanied by a detailed and complete publication, which renders the practical application of the invention possible.

e. The cost for the granting of a patent should be moderate; but in the interest of the inventor, an increasing scale of fees should be fixed, so as to cancel a useless patent as soon as possible.

f. It should be easy to obtain, through a well organized patent office, the specifications of any patent, as well as to ascertain which patents are still in force.

g. Laws should be passed by means of which a patentee may be compelled, in cases of public interest, to allow the use of his invention for a suitable remuneration to all *bona fide* applicants.

For the rest, and especially with respect to the proceedings in the granting of patents, the Congress refers to the English, American, and Belgian patent laws, and to the proposition made by the union of German engineers for a patent law of the German empire.

RESOLUTION III.—In consideration of the great difference between the existing patent laws, and in consideration of the altered state of international communication, the necessity of reform becomes evident, and it is to be strongly recommended that the different governments should endeavor to arrange, as soon as possible, an international understanding on the patent laws.

The not executing of a patent in a country is no reason for its becoming void in that country, as long as the invention has been carried out once, and the possibility is there that the right of using the invention can be obtained by any inhabitant of this country."

Resolution I (*f*).—This, we suppose, is a hit at Holland and Switzerland, where there are no patent laws. The Hollanders will laugh at the idea of injury to their country by the departure of their inventors. There are almost none to depart. The object of a patent law is not to prevent emigration, but to bring forth an abundant supply of new and original improvements, the working of which shall promote industry and happiness among the people, thereby increasing the national wealth and strength.

Resolution II (*b*).—The best patent law is that which supplies the inhabitants of a country with the greatest number of new and useful discoveries. The less the costs to which the inventor is subjected in maintaining a patent, and the more simple the process of obtaining it, the more will he be encouraged to invent.

The system of preliminary examination here proposed is intended to be something like that now in vogue at our Patent Office at Washington, which is believed by many to be productive of more mischief than benefit. It consists in the maintenance, at the expense of the inventor, of an army of paid officials, whose prime duty it is to find objections to the grant of petitions to patents, and it compels applicants to support another corps of lawyers and agents to combat the points raised by the examiners.

The inventor himself is the best examiner. All the government needs to do is to supply him with copies of previously granted patents at a cheap rate. He can then decide for himself, without official assistance, whether or not he ought to apply for a patent.

(*e*)—The increasing scale of patent fees here recommended exists in nearly all European countries, and, instead of being advantageous to the inventor, works practically to his disadvantage. Take England, for example. The second patent fee is $250, the third, $500. We have in mind now the actual case of an inventor of a valuable improvement. He is a poor man. With great difficulty he was enabled to meet the second fee of $250 which made his patent valid for three and a half years longer. That term is now about to expire, and he is called upon for $500 more which he will be unable to pay; and for want of the money, will lose his patent just as he was in prospect of making an advantageous arrangement for introducing the invention in England.

The interest of the inventor demands that only one fee, and that a very small one, should be charged for a patent. The practical effect of this increasing scale of fees is to subject meritorious inventors to serious pecuniary losses.

(*g*)—Why should laws be passed to fix the prices of commodities that inventors sell any more than the goods sold by ordinary merchants or traders? The Congress fails to give us any reason for its recommendation of this outlandish proposition. Its practical effect would be the appointment of a board of officials, to be paid and supported by the inventor, charged with the duty of depriving him of all voice in the sale of his own inventions.

Resolution III.—In Austria and some other countries the inventor is required to put and maintain his invention in use within a specified period—a year, or two years—after the grant of the patent. Failing so to do, the patent becomes null. By this resolution a change is recommended, to the effect that it shall suffice if the inventor only once begins the manufacture, he not being required to continue the work.

This is the most novel and liberal suggestion contained in any of the resolutions.

HOE'S NEW PRINTING PRESS.

A new style of steam printing press, of the fast kind, specially intended for daily newspapers, has just been perfected and put in operation in London, by Messrs. Hoe & Co., the well known press makers of New York city. The new press is designed for the use of the London *Daily Telegraph*, a two cent paper, said to have the largest circulation of any daily newspaper in the world.

The improved machine, on a recent trial at Lloyd's paper mill, Bow, actually printed and delivered, in even piles, twenty-two thousand copies of Lloyd's *Weekly*,—a large sheet—in sixty minutes, with the attendance of two men and a boy. The sheets are delivered printed on both sides, and the number of newspaper impressions when the sheet is cut apart by the machine is forty-four thousand per hour. The machine is built on the rotary plan like the Bullock, Walter, and other presses, and is said to yield superior printing.

The cost of each press is $17,500. The *Telegraph* is to be supplied with ten of them, and thus have the means of printing 220,000 copies of the paper in sixty minutes.

THE BALLOON VOYAGE TO EUROPE.

It is now definitely announced that the *Graphic* balloon will start on its transatlantic voyage between September 1 and 10. We understand from Mr. Donaldson, one of the aeronauts, that the last mentioned day will in all probability be the day of departure. The principal part of the labor of construction of the great air ship is done, and nothing remains but the completion of a few details and the joining of three or four seams. The rainy weather during the past few weeks has retarded the work and prevented the rapid drying of the varnish, thus causing inevitable delay.

The entire apparatus, when finished, will be transported to the Capitoline grounds in Brooklyn, N. Y., and there a preliminary inflation with air will take place in order to test the gas-holding power of the fabric. The balloon will then be emptied, and, if the prognostications of the Weather Bureau prove favorable, will be inflated to its full capacity of 450,000 cubic feet of illuminating gas. The ascent will be made at about six o'clock in the evening, that time being chosen from the fact that the gas will be rapidly condensing, and hence a greater sustaining power can be gained than if the balloon were filled during the heat of the day, when its contents would be subject to increased expansion.

We notice that a petition, signed by several prominent members of the community, requesting that the public be admitted to witness the ascent of the balloon, has been sent to the managers of the *Graphic* company. In perusing this document, we are somewhat at a loss to determine which amuses the most, the verdancy of its signers in gravely beseeching the *Graphic* people to perform precisely what the latter could not possibly be induced to forego doing, or the delightful coquetry with which our enterprising contemporary dallies with the request through some three sticks ful of double leaded editorial, after the fashion of "whispering she would ne'er consent, consented." Really, for any one to suppose that the originators of this very laudable scheme have, or ever had, the remotest intention of letting that balloon go without parading the circumstance with just as sonorous a flourish of trumpets and before as big a multitude as can possibly be assembled, indicates an ignorance of modern journalistic enterprise which is refreshing in its utter simplicity.

In a succeeding number, we shall publish some interesting details regarding the construction of the balloon, together with illustrations of ingenious and novel devices to be used during the voyage.

MODERN MIRACLES.

However much believers in the progress of reason and consequent decline of superstition may argue that the age of miracles has passed, and that such supernatural phenomena would be speedily stripped of their mystery by the scientific rationalism of the day, it is nevertheless an undeniable fact that a tangible confutation of their views now exists, and that a so-called miracle has taken a firm hold, not merely upon the masses, but has carried conviction to many learned and distinguished savants and men of eminence in a nation, one of the foremost in the ranks of modern civilization.

Since the Franco-Prussian war, a religious revival of unprecedented fervor has taken place in France, and a series of remarkable pilgrimages are now being made to the locality where the above referred-to miracle took place. This celestial manifestation is based on so frail a foundation that it adds further proof to the well known saying that a people desirous of believing will always find foundation on which to ground their belief. The story goes that Bernadette Soubirons, a weak and sickly peasant child residing with her parents at Lourdes, France, while gathering wood with her companions, reached a grotto, near the town, in which was a shrine to the Virgin. Kneeling to repeat her prayers, the girl felt an "invisible" wind, saw a glorious radiance, and beheld a woman, who, her instinct told her, was the Virgin, standing on the rock. Returning home she told her vision and described the garments of her celestial visitor, even to a string of white beads on her head. On again repairing to the grotto, Bernadette received other visitations; finally the story spread, a sign was asked for, and a spring of water, to which wonderful healing powers are ascribed, gushed from the rock.

If there be any miracle in the circumstance, it seems to us to lie in the fact that people, not by tens and twenties but by hundreds of thousands, constantly attest their belief in it; and stranger still that scientific journals as able as *Les Mondes* should devote pages to defending its authenticity. A sick child laboring under a disordered constitution, and a spring opportunely trickling from the stone, sum up the entire wonder.

The peculiarity of this especial mystery is that it is not susceptible of direct test, and is, therefore, a mere matter of faith. There has apparently been no attempt at deception on the part of its originator, and hence the credence placed in it is a matter of mere volition on the part of believers.

If the editor of *Les Mondes* will visit any negro camp meeting in the United States, he will remark innumerable repetitions of fits of religious ecstacy, such as that of Bernadette. He will find both young and old of both sexes shouting, singing, and launching off into descriptions of golden cities and celestial inhabitants, which they sincerely believe they see, which will throw the peasant girl story far into the shade.

THEORIES OF THE SUN SPOTS.

The question of the solar constitution, and more especially that of the nature and cause of sun spots, has ever since the first discovery of the latter phenomena, by Galileo, Fabricius and Scheiner, been a constant subject of difference between students of astronomical physics. Totally opposite theories have been enunciated, and have found able and learned supporters, only, however, to be abandoned for new views formed by the light of more recent investigation; and thus up to the present time, no solution of the problem, to the entire satisfaction of the scientific world, has as yet been adduced.

In here referring to the subject we allude briefly to the principal ideas held by some eminent astronomers and physicists, but more especially we lay before the reader the two theories which are now attracting considerable attention through the extended public discussion by their learned originators. Early observers (Galileo and afterwards Hevelius) attributed the spots to dark *scoriæ* floating on solar seas. In 1769, Dr. Wilson determined them to be cavities or depressions below the sun's surface, a view confirmed by the researches of Sir William Herschel. The latter astronomer's theory suggested the enclosure of the sun by two strata of clouds, the outer one self-luminous and the other opaque, though partially illuminated by the outer layer. When a opening was formed through both strata, the dark body of the sun appeared surrounded by a penumbra, due to the less luminous under layer. Kirchoff advanced the idea that the spots were clouds, floating in the sun's atmosphere and obscuring portions of the glowing surface. Subsequently a protracted controversy arose between the French and English astronomers, the former maintaining that the absence of light was due to a defective radiation of a gas in the sun, the latter to absorption. De la Rue, Stewart and Loewy held the last mentioned view; and in 1866, their

ideas were in substance confirmed by the spectroscope observations of Lockyer and subsequently of Huggins. The spots were proved to be owing to general absorption, to "something over the bright portions of the sun that eats away the light." Proctor has suggested volcanic action, intensified by the proximity of some planet as a cause; and in a paper read before the Astronomical Society, he considers that the closeness of the moon to the earth stimulates terrestrial volcanoes to renewed activity, and adds that in 1860 the belts of Jupiter were strongly disturbed during changes in the solar envelope.

The opposing theories, the discussion of which is now filling the columns of European scientific periodicals, are respectively those of Faye and Father Secchi. The latter has by far the strongest support, and appears to be sustained in his views by Lockyer, Huggins, Young, Zöllner, Spoerer, and Tacchini, besides many others of eminence. M. Faye's theories are briefly as follows: He supposes a nebulous or chaotic fluid mass, formed of gas and mixed vapors, raised to a very high temperature, animated with a movement of rotation and cooling by way of superficial radiation into space. Through the condensation of vapors of the external layer, the photosphere is formed and the chromosphere separated, the latter being composed of hydrogen, relatively cold but at a temperature superior to the point of dissociation of nearly all its compounds. By the peculiar mode of superficial rotation, the angular velocity of which decreases rapidly from equator to poles, the interior movements are reduced to simple ascending and descending vertical currents. These, by their play, maintain the photosphere at all points of the surface. The variation of velocity of rotation of these streams gives rise to their eddying movements, so that whirling phenomena or cyclones are produced. Viewed from above, from a point at some distance from the earth, ordinary waterspouts would scarcely appear except as simple points; but terrestrial cyclones, the diameter of which is sometimes hundreds of miles, would have the effect of circular cloudy spots in the form of funnels, variously lit by the sun and roving slowly over the earth. Evidently the special rotation observed in the sun would produce similar phenomena, giving rise to the appearance of pores and spots. An analogy is traced between solar and earthly storms, the latter of which are not formed in the polar or temperate regions, but in the torrid zone. The only difference lies in the fact that the solar cyclones remain in the regions where they are generated, between parallels 40° north and south, and have hardly any movement of translation but those of currents parallel to the equator. Under the action of these storms, M. Faye adds, there is a circulation of the exterior hydrogen which penetrates into the superficial red layers, to return immediately to the surface.

Father Secchi states that, in the interior of the spots, a peculiar spectrum is met with, disturbing the harmony of ordinary intensities and presenting enlarged and dilating lines in the position of those of the metals sodium, iron, magnesium, and calcium. In brief, he considers that the spots produced by eruptions abound in metallic substances, and especially in those just mentioned. The dark masses may accumulate at the orifice of the eruption and there unite in a single mass, condensed under the influences of currents from various neighboring orifices. The size, the duration, and the intensity of the spot depend on the quantity of eruptive matter; and an agglomerated mass may continue a long time after termination of the eruption, being fed by a slow successive eruption of the same substances. The mass sinks by gravity into the photosphere, cutting off a portion of the light of the sun, and appears black, although, according to Zöllner, the dark *umbræ* emits four thousand times as much light as that derived from a equal area of the moon. Both Faye and Secchi agree in the view that the sun is mainly gaseous, as it is only by such a hypothesis that the smallness of its density can be explained.

Professor Young, since the opening of the present session of the American Association at Portland, has presented some new suggestions on this subject, in which he considers that the phenomena of eruption indicate the existence of a crust which restrains the gases and through which they break their way. This crust may consist of a more or less continuous sheet of rain, formed of the materials shown, by the spectroscope, to exist in the solar atmosphere. As this tremendous rain descends, the velocity of the falling drops is retarded by the resistance of the denser gases underneath; and these drops coalesce until a continuous sheet is formed; the sheets uniting form a sort of bottomless ocean, resting upon the compressed vapors beneath and pierced by innumerable ascending jets and bubbles. In other words, the sun, according to this view, is a gigantic bubble, the walls of which are constantly thickening, while its diameter is decreasing at a rate determined by its loss of heat. Unlike other bubbles, however, its skin is continually penetrated by blasts from within.

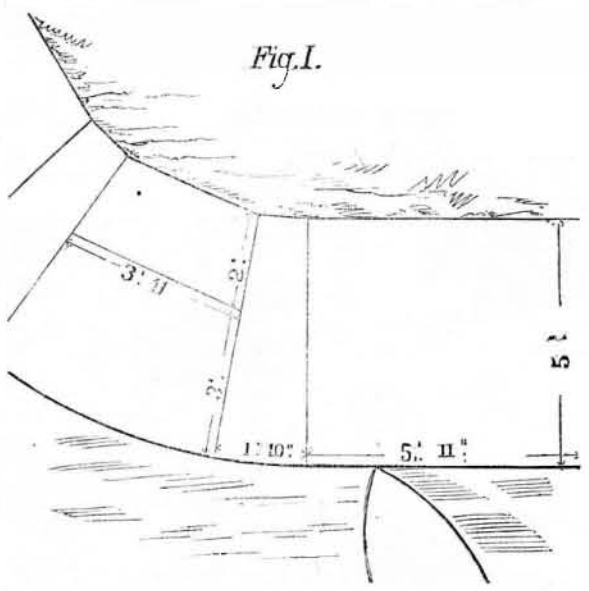
We may add that the eruptive theory is that now generally accepted by the majority of eminent astronomers. As Professor Young says, however, "we do not know what sun spots are: we do know what they are not;" so that, as is the case with all theoretical speculation, even this widely received view may be sooner or later abandoned, when, in the progress of science, other revelations are made.

J. H. H. writes to say that stramonium, known also as Jamestown (corrupted into jimson) weed, is an effective remedy for snake bites, and will cure them even some days after they are inflicted. The weed should be applied in the form of a poultice. In the absence of any other remedy, cauterizing the part with a live coal is good, especially for horses and cattle.

ACCIDENT TO THE NEW DOCKS.

The City of Limerick, one of the smaller steamers of the Inman line, through faulty navigation, recently rammed the bulkhead of pier No. 1, North River, with her bow, striking the stone near the angle and in the direction indicated by the prow in Fig. 1. The rate of speed of the ship at the time, we are informed, was fully four knots per hour. The material of

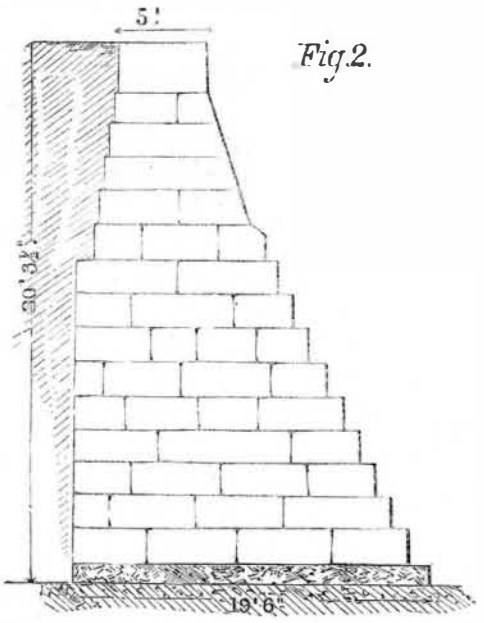
Fig. 1.



the structure is a coarse strong granite from Biddeford, Me., hewn in heavy blocks of various sizes. The effect of the blow was to wedge the stones apart. Little crushing was done, though an angular fragment from one block was split or torn cleanly off. The stones were shoved helterskelter in every direction, so that the damage consists in the displacement of the masonry not only at the point of contact but for a distance of 75 feet one way and 25 feet the other. The entire adjacent portion of the bulkhead, therefore, including the boat landing, will have to be rebuilt at an expense, it is estimated, of about $25,000.

The failure of the structure to withstand the blow is due, manifestly, to its insufficient backing. The uninjured masonry seems to be well set together with Portland cement, and, as shown in cross section in Fig. 2, is 4 feet 3 inches through at the top, 19 feet 6 inches at the bottom, and rests

Fig. 2.



on a bed of concrete and riprap. The hight is 30 feet 3½ inches. Behind this wall, however, is merely earth thrown in and not packed or rammed down,—a precaution, in fact, not as yet taken, because no craft larger than a ship's launch was expected to come near the work. The consequence was that the loose soil yielded, while the ship escaped with no other injury than some scratches and a lump of granite imbedded in her bow.

The impetus of a vessel such as the City of Limerick, displacing in the neighborhood of 4,000 tons, and moving at the rate of three knots per hour, or five feet per second, is stated to be nearly 3,000,000 foot pounds. This tremendous force concentrated in the stem of the vessel—a solid mass backed by the heavy iron skin and only some six inches in width—necessarily would produce no small effect on almost any masonry, however strong. It is well known that a large vessel can strike head on with hardly any injury to herself; and on this fact the use of rams in naval operations is based. In the present instance there is little doubt but that, had the wall been stronger, although it would have been badly damaged, the ship would have suffered the most. In such case the force would have been expended in crushing stem and stone, neither yielding instantly to the impact. As it was, the blocks of granite gave way, and the comparatively small amount of splintering which they suffered shows that they were easily driven backwards into the loose earth. Considering the degree of injury, it seems to us that the crushing and ruining of a number of stones in a solidly backed wall would have been less expensive to repair than the dislodging, which necessitates the replacement of about a hundred feet of finished wall.

The accident, we think, has demonstrated the necessity of a solid brickwork or other equally strong re-inforcement to the masonry; particularly, as it appears quite probable, judging from the extent and circumstances of the present damage as far as known, that even a tug striking the pier at ordinary speed might have inflicted a serious though less injury.

On the same pier at which the above described accident took place, we noticed, out of range of the effects of the shock, stones displaced and open cracks between them; while parts of the concrete flooring have broken joints and sunk below the level. The difficulty was explained by the fact that the stone had settled on its riprap foundation.

HAY FEVER.

At this season of the year, there are many suffering from this tormenting trouble; and to them it would no doubt be a gratification to learn of a sure cure. But unfortunately there is none yet known, except that which, to the majority of sufferers, is impossible from want of time or means, namely, a temporary change of residence. There are, however, palliative remedies which often bring great relief. One of the best is a tea made of poppy heads.

The poppy is so generally cultivated as a garden plant that it is quite easily obtained; if not in our own, it may be in our neighbor's garden. The tea should be made to boil in an ordinary tea kettle, and the steam, issuing from the nozzle, breathed deep into the lungs; and this should be continued until relief is obtained. If the poppy heads cannot be had, half a teaspoonful of laudanum may be added to a pint of water, and the steam from this mixture inhaled. At the same time attention should be given to the general health; only digestive and nutritive food should be eaten, because an attack is much aggravated by overloaded stomach or bowels.

In conclusion, let us add, for the benefit of those who are subject to yearly attacks, that much good is done by preparing the lungs for the coming hay season. If a teaspoonful of alum be dissolved in a pint of water, and the spray from this mixture be breathed into the lungs for several minutes every day for a month before the expected onset, it will brace up the lungs and make them less susceptible to the irritation of hay dust.

S. H. C., M. D.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW ANILINE BROWN.

A new dye, called cannelle, produces upon silk, wool, and cotton a lively brown color, and, by admixture with blue, red, or yellow aniline dyes, is capable of assuming every possible shade and variation of brown. For silks and woolens, no mordant is required; but, like all other aniline colors, it refuses to attach itself to cotton without a mordant. Silk is dyed in a lukewarm bath to which is added a sufficient quantity of the dye, which has first been dissolved in hot water, and, when cold, filtered through flannel. The dye bath is made slightly acid by the addition of tartaric acid. Wool is dyed in a boiling solution of the dye, to which is added half a pound of Glauber salt and 2 ounces sulphuric acid to 10 lbs. of wool. Cotton is mordanted with tannin by placing in a solution of 3 lbs. sumach or ¼ lb. good tannin to 10 lbs. of cotton. After being mordanted, the goods are unrolled and put in a cold bath of pure cannelle.

Cannelle is prepared from one of the products used in making fuchsin, and is essentially the double acid salt of chrysotoluidine. This latter base is formed from toluidine by the removal of hydrogen, just as the base of fuchsin is prepared from a mixture of aniline and toluidine, and its composition is represented by the formula $C_{21}H_{21}N_3$. Its formation from toluidine is thus represented · 3 C_7H_9N (toluidine)— 6 H = $(C_7H_7)_3 N_3$ (chrysotoluidine).

This dye is also very similar to fuchsin in its nature. The free base is insoluble in water, and therefore may be thrown down as a bright yellow precipitate by the addition of an alkali to an aqueous solution of its salts. Chrysotoluidine is very soluble in alcohol, and can be used in this form for dyeing, while rosaniline and its derivatives are colorless, except as neutral salts. The neutral salts of chrysotoluidine dissolve with difficulty even in boiling water, and are decomposed thereby into insoluble basic salts and soluble acid salts. The solutions of the soluble acid salts have a pale yellow color with a brownish tinge, while free chrysotoluidine gives pure yellow shades. The same pure colors are obtained by dyeing with the acid salts, provided some alkali is added to the dye bath. Cannelle is at present manufactured, so far as we know, only in Stuttgart, Germany.

MUSCULAR FORCE OF INSECTS.

M. l'Abbé Plessis, in an article in *Les Mondes* on the above subject, says that, by way of experiment, he placed a large horned beetle, weighing some fifty grains, on a smooth plank; and then in a light box, adjusted on the carapace of the insect, added weights up to 2·2 pounds. In spite of the comparatively enormous burden, being 315 times its own weight, the beetle managed to lift it and move it along. A man of ordinary muscular power is fully a hundred times feebler in proportion; and had an elephant such comparative strength, it could run away with the Obelisk of Luxor, a load of 5,060,000 pounds. Similarly, the flea, scarcely ·03 of an inch in hight, manages to leap without difficulty over a barrier fully 500 times its own altitude. For a man six feet is an unusually high leap; imagine his jumping 3,000 feet in the air, over three fifths of a mile!

NEW PROCESS OF PRINTING WITH INDIGO.

M. Lalande reduces indigo by means of hydrosulphite of sodium; and to the white indigo thus obtained, he adds an excess of the salt, to produce a suitable consistence. With this preparation, he prints fabrics, and afterwards exposes them to the air. The excess of hydrosulphite causes the rapid oxidation of the indigo.