such as contain antimony. What is called mechanical *Pattinage* is used at Stolberg, but the zinc method, employing steam and hand work, is now substituted for all kinds of ores, especially pyritous and blendes.

Another step in advance is the completion of the mechanical preparation works at Clausthal, commenced about eight years since. This immense establishment, more than 1,000 feet in length, is chiefly designed for silver leads, blendes, and the Hartz mountain deposits. It combines all of the latest improvements, and enables the government to economize all of the precious metals of that region, and serves for the education of a useful class of metallurgists.

Similar works have also been constructed at Ems, where the character of the ores is more in the yield of lead than of silver.

In the metallurgy of zinc, there has been a great improvement by the adoption of the regenerating furnace. At the extensive zinc works in Belgium, there is one furnace which runs 160 muffles, and the gas regenerating furnace has nearly everywhere superseded all other forms. In lower Silesia, they work ores of zinc which do not contain more than nine to ten per cent.

The economical use of iron slags has been pushed so far that Professor Egleston made the startling announcement that there are a good many furnaces on the Continent which actually sold their slags. The slags are either run directly into iron wagons or into water for granulation. They are worked up into cement and artificial building stones, are employed in chemical processes, especially the manufacture of alum, and are used to make crown glass where lime is required; and, in general, waste cinders are fast becoming a thing of the past.

The progress in steel manufacture has been very great, especially in the size of the pieces cast, and in mechanical contrivances for handling and working them. Twenty-five tun hammers are not uncommon. At Krupp's renowned establishment he was received with the utmost courtesy and shown everything. The great secret of the efficiency of these works is in the military discipline which prevails. The different gangs of men are marched up, deployed, and manœuvred precisely like companies and regiments of soldiers; and there is no haste and no confusion, so that any number of crucibles of melted steel can be brought and poured out without any company coming in contact with another.

Krupp now proposes to construct a hundred tun hammer. By a new contrivance of reversing the rollers, heavy steam carriages are superseded, and the armor plates or rails go back and forth.

The ideas in reference to the construction of blast furnaces are much modified. They now build them without the massive outer coating, and sometimes exclusively of fire bricks, and much more open and accessible below.

In general, according to Professor Egleston, the progress of metallurgy in Europe has been very great within a few years, and he promised to present the chief points, for the information of the Society, during the course of the winter.

MASTER AND APPRENTICE.

The relation of masters to their apprentices may form a theme upon which a few hints may be profitably thrown out, although unfortunately, as we think, for the industrial interests of the country, these relations have changed very materially during the last fifty years. The old system of binding boys to a term of service, for which their reward should be largely in instruction imparted to them, has given way, in good measure, to the method of paying stipulated money reward for very limited terms of service, instructing the youths so employed only in some few details of a trade, and then getting as much as possible out of them for the money paid.

The result of this is that the proportion of really skilled workmen, when considered with reference to the aggregate number engaged in mechanical avocations, has greatly diminished; while many who are called machinists, bootmakers, or carpenters, are really only competent to run a lathe, to peg on a sole, or to shingle or clapboard a building.

There are, however, some shops which adhere more or less to the old apprentice system; and, whether they do or not, there still remain certain duties which masters owe to the youths employed by them, which, we fear, are often too much neglected.

While the full parental power of control, and the father's right to exact obedience, are, under the modern system of limited service, perhaps not to be considered as vested in employers, the duty to watch, with some care, the habits of boys, and to counsel and admonish them when likely to go wrong, is a duty devolving upon every master, and one which he ought not to shirk.

It is his duty, also, to judiciously praise and encourage all that he sees commendable, in their habits or handiwork, thus cultivating their self respect, and that regard for the opinions of others which forms in youth one of the most powerful stimulants to well doing, and one of the strongest safeguards to morals.

It is his duty to reprove when reproof is deserved, and to set such an example to others that his reproof will deserve and command respect. But his reproof should be so tempered with kindness, and an earnest desire for the good of the one reproved, that evil passions shall not be roused into violent opposition. It is his duty to instruct, not only in the elements of the calling upon which his apprentices are entering, but upon all matters of life experience, upon which his age and knowledge of the world have rendered him wiser than his young assistants.

How many masters throughout this great country are performing these obvious duties with fidelity? How many of them can point to this or that young man who is going to the bad, and say, "My conscience is guiltless of neglect toward him?"

The dictates of common humanity, not to say Christianity, should prompt every master to watch, counsel, admonish, reprove and instruct, as seems necessary for the good of the young minds and hearts over which he has some measure of authority. The man who refuses or neglects to do this is neither humane nor Christian.

FAIR OF THE AMERICAN INSTITUTE.

ELECTRICITY.

Electricity, in one form or another, plays a prominent part at the exhibition this year.

RHUMKORFF'S INDUCTION COIL.

This wonderful instrument is exhibited by the Stevens Institute of Hoboken. Its length is 40 inches, hight 18½ inches, and it weighs 166⅔ pounds. The primary wire is 200 feet long, while the secondary wire is 234,100 feet, or about 44⅓ miles. The battery employed to charge it consists of three glass jars, 10 inches diameter and 12 inches high, into which are lowered, by a windlass, fifteen plates of zinc and fifteen of carbon, each 6×9 inches. The exciting liquid is the usual mixture of bichromate of potash and sulphuric acid. With the above battery freshly charged and immersed 1 inch, the coil freely gives sparks 21 inches long in air, and white Leyden jar sparks 14 inches long; and the spark can be made to penetrate glass 3 inches thick. This performance has never been exceeded by an induction coil, and it is satisfactory to know that it was constructed by our countryman, Mr. E. S. Ritchie, of Boston. A few years since, the coil belonging to Columbia College, also made by Mr. Ritchie, was carried to Paris by Professor McCullough, and shown to Rhumkorff, who was so much astonished at its superiority over anything that he had ever constructed, that he begged permission to dissect it. This permission was granted, and he found that Ritchie's insulation and manner of winding the wires was superior to his own, and he adopted the American form.

It is generally admitted by physicists that Ritchie's contributions to our coils have been of great value, and that he has built several instruments superior to any of European manufacture. The performances of the monster coil are highly suggestive of a severe thunder storm, especially when the Leyden jar is filled and discharged in rapid succession. The effect of these discharges is to fill the air with the odor of ozone, and it is a question whether the instrument could not be used, as a convenient generator of this form of oxygen, on a sufficiently large scale to be employed as a bleaching agent in the arts.

BURGLAR ALARM.

There is the usual ringing of bells and perpetual din made by the opening and shutting of doors, to which the wires are attached, while the efficacy of this system of security against unwelcome visitors is set forth by the inventor or his agent. The plan of having the bells continue to ring until the connection is broken by some one in the house, is a capital one; and, if a bell on the street could be rung at the same time to attract the notice of the police, the rogues would be apt to vacate such premises, as being too uncomfortable for quiet work.

ELECTRO-PROPULSION MOTOR.

This is the name given to an invention for working sewing machines by magnetism. To the end of a long lever are attached two iron armatures, and, by an ingenious pole changer, the magnetic force is made to operate first on one side and then on the other; and, as the lever oscillates, it turns the crank of the wheel which is to do the work. The inventor uses four large cells of a Bunsen bichromate and carbon battery, to charge the magnets. The novelty of the adaptation consists in the manner of applying the pole changer, in the cup shape of the armature, and perhaps in the peculiar form of lever.

The circular which was handed to us, says: "This apparatus can be applied for propelling sewing machines, as now on exhibition; also other machinery and street cars—as any power desired can be obtained by *magnates*." There is considerable truth in the latter part of the claim, as the magnates of our city can testify; as to the power of magnets to propel "street cars and other machinery," there appears to be some difficulty, as it has never been successfully accomplished. There is a small locomotive, driven by magnetism in another part of the building, but this moves in such a weak timid way, as to suggest a break down the moment a load is attached to it.

Of the Electro-Propulsion Motor, the circular further says: "It dispenses with the use of the feet, which, in the opinion of the medical faculty is so injurious." We agree with the medical faculty that it is injurious to dispense with the use of the feet, and are decidedly in favor of plenty of exercise. If it is true "that the apparatus can be *prefixed* to any kind of machine," we are likely to see much of it. It will be necessary, however, for the inventor to employ a more economical and convenient form of battery, before he can expect to induce many private individuals to try the new motor.

PHOTOGRAPHS OF MAGNETIC FORCE.

A beautiful application of photography, to the illustration of physical phenomena, is shown by Professor Mayer, of the Stevens Institute, who exhibits plates of the diagrams, formed by magnetic force, very much resembling the sound pictures, so long familiar to the students of philosophy.

Professor Rood made photographs of the electric spark in a manner somewhat similar to this, an account of which was published in Silliman's *Journal*.

Putting electricity and magnetism on paper is one of the best ways in which to study these phenomena, and is a feature in modern research.

ELECTRICITY APPLIED TO MEDICINE.

The number of pieces of apparatus for the use of the medical practitioner, shown in the Fair, is unusually large, and indicates greater attention to this branch of therapeutics than formerly. Some of the contrivances would be highly prized by teachers in our schools, if they were better known, and could be had of dealers in philosophical instruments. We have to note particularly cauterizing instruments, an improvement on Stoehrer's induction apparatus, a universal platina zinc battery (which would be an admirable thing for professors of physics, if they knew about it), and a battery for galvano-caustic, exhibited by Curt W. Meyer; to this list, must be added the electro-medical generator of Professor Steele, and the portable machines of the Galvano-Faradic Company. The electromagnetic machine of the latter company is highly commended by some of the best physicians in New York, and, from the cursory examination we were able to make of it, we are disposed to cordially unite in calling attention to its efficiency, convenience, ingenious adaptation to a variety of uses, portability, endurance, and simplicity. While it is specially constructed for the use of the medical profession, it has many points to command the attention of all persons who may have occasion to employ induced currents for any purpose whatsoever.

GALVANIC FLUID.

There are so many fluids that can be employed in galvanic batteries, that it is difficult to see how any one of them can be patented; and, after they are patented, we should suppose that most persons would prefer to know what they were using, rather than to blindly follow a prescription. This reminds us that we found one exhibitor who bought his bichromate of potash, at a high price, already in solution, under the head of a "yellow liquid," without knowing what it was. We suggested a saving of fifty per cent, by using the dry salt and Croton water.

OTHER APPLICATIONS.

We do not refer to the telegraph, as that has become an old story. Nickel plating, which a short time since, was uncertain, now comes out brighter and more durable than silver. Aluminum plating is yet to come, but can hardly rival the pure white of nickel. Galvanoplastic is represented in a few groups, and indirectly in ornamental decorations of machinery. It would have been instructive to the public to have had the whole process of electrotype deposit illustrated and explained.

Electric clocks, with self feeding battery, and bank alarms, were on exhibition, and there may have been other pieces, of apparatus in which electricity played a part, which escaped our notice. We should have been glad to see a good thermo-electric pile, a cheap ozone generator, a large Ladd's magneto-electric machine, a meteorograph, alarm thermometers, electric pianos, engraving by electricity, electric car brake, Casselli's telegraph for sending autograph messages, electric lights, electric safety lamps, and a suite of galvanic batteries, such as we have seen at exhibitions in other countries. Much more has been done in the line of the application of electricity to the arts than is commonly supposed, and it would be of great use to the community could all of the contrivances be collected into one exhibition for comparison and study.

BULKLEY'S PYROMETER.

In our recent notice of this invention, we gave the address of Mr, H. W. Bulkley as 10 Barclay street; it should have been 98 Liberty street, New York city.

A REMARKABLE HISTORY---A TRUE STORY THAT IS STRANGER THAN ROMANCE--HOW MISFORTUNE WAS CROWNED BY SUCCESS.

In 1858, Mr. Thomas Sheehan, now as well as then of Dunkirk, New York, foreman in the blacksmith department of the Erie Railway shops at that place, patented, through the SCIENTIFIC AMERICAN PATENT AGENCY, a submarine grapple, which, though an ingenious invention, proved to be one for which there was little demand.

This was his first invention; and the cost of its completion, together with one year's struggle to manufacture and introduce it, completely exhausted Mr. Sheehan's means, and reduced him to the extremest poverty. Now Mr. Sheehan, though not fortunate in inventing, making, and selling submarine grapples, had, in conjunction with his good spouse, been eminently successful in increasing his family, which comprised eight children at the close of the year of struggle above mentioned.

Eight children, and an empty larder, are rather stern facts when a father is called upon to meet them; and in this case our inventor's troubles were increased by the not unnatural complaints of his wife, who accused him of having left a good situation to pursue a chimera, thus reducing his family to pauperism. In fact, the good woman was decidedly bitter, and her acerbity, added to the really desperate condition of Mr. Sheehan's finances, produced in him a mental state under which some men would have permanently gone to the bad.

Not so our inventor. He kept a stiff upper lip, and sought long and anxiously to provide support for the hungry mouths that appealed to him for food.

It did not subtract from the trouble of this critical period in Mr. Sheehan's life, to discover that his failure had been due, in great measure, to the derelictions of a partner whom he had taken in with him to aid in conducting the grapple business, and who he found had taken undue advantage of his position, selling wares for which no returns were ever made to the firm, and otherwise misconducting himself.

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Just at this crisis, Mr. S. D. Colwell, an old friend of Mr. Sheehan, and General Freight Agent of the Erie Railway at Dunkirk, chanced to meet our inventor in the streets of that thriving town, and accosted him, with

"Well, Thomas, how are the grapples? I hear they have used you up."

"Yes," was the answer, "the grapples have done my business; I wish I had never seen them."

"Throw 'em away," advised Mr. Colwell. "Have you any now finished?"

"I have one almost done," said Thomas.

"Finish that; I will pay you forty dollars for it, and have it used for picking up coal at the dock. The money will help you in your present emergency, and you can go back to your old place in the shop and earn a good living for your family."

"I will," said Thomas.

Back to his humble home, went our inventor with new hope in his breast, and set himself to finish the grapple with all due speed. But, alas, upon what slender threads do the fortunes of men hang! A tap, the only one our inventor had of the size required, suddenly snapped asunder, and, as it was essential to the progress of the work, he must have a new one or he could not go on.

In this strait, he applied to his wife to lend him twenty-five cents to buy the necessary steel to forge the tap. But she, having no faith in the grapple, refused, for the two very good reasons—first, that she believed the money would be thrown away if she gave it to her husband; and second, that she had not the money to give him, even if so disposed. The refusal was seasoned with some very hot word-spice that made it very unpalatable to Thomas. But he bethought him of a merchant, who, in brighter days, had seen the color of his money, and who, perhaps, would now give him credit for the small modicum of steel he required for the tap.

To this merchant he hied, and, somewhat reluctant to prefer his request, began beating about the bush; and, finally straying into politics, hot words passed between them, and our friend, feeling his manliness would suffer too keenly by asking credit for the steel, came away without it.

With no definite purpose he went home, pondering upon how he should surmount this, now no trifling, obstacle of the broken tap.

He found his wife making ley for soft soap, but her acidity in no way neutralized by the alkaline reaction. Despondent and discouraged, he sat down, in no very enviable mood, when he chanced to spy a piece of iron lying near the tubs at which his spouse was working. Meditating upon how he could make that piece of iron hard enough for a tap, he was led to a rather rude experiment, the results of which have in the end made him a richer man than he ever dreamed of being.

It so happened that from a distant relative, a Roman Catholic priest in Ireland, our friend had inherited quite a library of works on chemistry; some of them rare and valuable. He had read some of these books to very good purpose. "There is surely carbon in that ley," thought he. "If I only could get that into this iron in the proper proportion, I should have steel, and from that my tap, and so finish my grapple."

With little hope or faith that he should succeed, he took some of the ley, and adding, without any particular reason for so doing, some saltpeter and common salt, made a paste with this solution and a hard grudged saucerful of the little remaining flour there was in the house. He then forged the tap, and, enveloping it in the paste, put the whole into a luted iron box and exposed it to heat for two hours in a blacksmith's fire. To his joy and surprise, when he took it out, it was hard enough to cut cast steel. The grapple was finished, and forty dollars flowed into the family treasury of Thomas Sheehan. He went back to his old work, disgusted with patents, and resolved never to have anything to do with one again. But the remembrance of the tap, hardened in so unique a manner, still haunted him. Having a great deal of case hardening to do, he thought one day he would repeat the experiment upon a large scale, which he did with perfect success.

For twelve months he went on to experiment, purchasing the materials with his own money, and working in secret by night, and at odd hours. At the end of twelve months, he reconsidered his sentence of condemnation on patents, and applied for one on his process, which was granted September 4, 1860, the claim being for a combination of damaged flour, potash ley, or ley from hard wood ashes, niter, common salt, and sulphate of zinc, for case hardening iron.

In 1867, he patented an improvement on the above named process, the improvement being the substitution of water impregnated with carbonic acid for the ley of potash or wood ashes.

In 1868, he took out another patent for an entirely new process, which consists in the use of raw limestone, charcoal, black oxide of manganese, sal soda, common salt, and pulverized rosin, combined, for converting iron into steel, which is now widely used, and from which he has reaped quite a fortune.

No less than twenty-three of the leading railways in America now use this process, under license from the patentee, for hardening the links, guides, pins, and nuts of locomotives, effecting, we are told, no less a saving than from five to six hundred dollars annually on each locomotive, in obviating the lost motion consequent upon the wear of links, guides, and pins.

The inventor has already received, for licenses under his patent of 1868, $29,650, and has just sold the remainder of his patent in America for $45,000. If on the day he broke his tap, in his cottage in Dunkirk, it had lasted till he finished his job, or if he had then had twenty-five cents, he would, in all probability, today have been a poor mechanic, working at his forge in the Erie Railway shops, and a process of national importance, in its effects upon the great railway system of the country, might never have been given to the world.

Never, perhaps, has the old adage, "Necessity is the mother of invention," received a more apt illustration, and never was the occasional value of an untoward accident more signally demonstrated.

MARQUARD'S ARTIFICIAL STONE.

If we watch the great amount of labor required to shape the rude stone, as it comes from the quarry, to the ornamental forms required for embellishing our modern architectural structures, we need not wonder that, long since, attempts have been made to produce these elaborate forms by molding. For interior work the plaster of Paris has been the successful substitute for ornamental stone, chiefly for statuary its pure whiteness, nearly imperceptible shrinkage, and the ease with which it is cast in forms, have secured for it the lasting favor of all. However it has grave defects; it is very opaque, of a dead white color, and lacks the semi-translucency of statuary marble, which causes this to be so far superior for all productions of high art; but its great defect is that it is too soft and cannot stand the weather at all; water dissolving it slowly, any product of plaster is ultimately destroyed by the rain. Therefore many attempts have been made to produce artificial stones having the advantages of plaster without the disadvantages just mentioned.

The *terra cotta* is nothing but a fine brick clay, requiring burning after being molded; but as in the burning it shrinks and changes its shape, it is unfit for fine work; also its color, which is either like brick or of a dirty brown or gray, is objectionable.

More successful have been those who experimented in another character, making use of the properties of the soluble silex, to combine with alumina, magnesia, lime, etc.; but here is a delicate distinction to be made, as the use of one or another of these ingredients, in different proportions, gives widely different results.

Among all the artificial stones which have recently fallen under our attention, we noticed in particular a compound, the result of experiments made by Philip Marquard, of 468 Swan street, Buffalo, N. Y., which, at first sight, struck us by its pure whiteness, semi-translucency (like marble), and the ease with which it appears to have been molded, evident from the ornamental shape of the samples sent us; by further investigation, we found it to take polish like marble, and to stand the severest weather, as water does not penetrate it in the least. Chemically, it is silicate of lime, with an excess of the latter; it also contains some alumina.

The inventor states that it is far cheaper than any natural stone worked by hand; and does not shrink in burning, coming out of the fire exactly equal in size and form as it came from the mold. All that is wanted to introduce this invention is a partner with some capital; and we do not doubt that, taking in account the excellence of the article, this will not be a difficult matter for the inventor and patentee to obtain.

SCIENTIFIC INTELLIGENCE.

SIMPLE TEST FOR ARSENIC, ANTIMONY, AND PHOSPHORUS.

The solution of the substance to be examined is first considerably diluted with water, and poured into a wide mouthed bottle, to the cork of which are fastened a number of pieces of parchment paper, previously saturated in acetate of lead, nitrate of silver, and sulphate of copper. A few drops of sulphuric acid are now added, some pieces of zinc thrown in, and the cork put on. In case any gases are liberated, they will react upon the strips of paper, and the color will disclose to what particular element the reaction is due. Phosphuretted hydrogen does not blacken nitrate of silver and acetate of lead, but does act upon sulphate of copper. Antimonetted and arsenetted hydrogen do not affect the nitrate of silver and sulphate of copper, but blacken the lead salt. Sulphuretted hydrogen, however, blackens all three of the above metallic solutions, In order to decide what elements are present, the strips of paper are to be macerated in a solution of cyanide of potassium. If the coloration immediately disappears, it was due to sulphuretted hydrogen: if it slowly changes in cold and more rapidly in heat, it was caused by phosphorus or antimony; if it only bleaches a little and turns brown, and does not disappear when heated, it may be traced to arsenic. For ordinary purposes and rapidity of work, this method appears to be sufficiently accurate and will enable the operator to dispense with the more cumbersome Marsh apparatus.

THE COLORING MATTER OF SMOKY QUARTZ.

In August, 1868, the largest deposit of deep black quartz crystals was discovered, in the canton of Uri, that had hitherto been found. Some of the larger ones weighed respectively 267 pounds, 255 pounds, 210 pounds, 134 pounds, and 125 pounds; and the total weight of the crystals found in the cave was 33,000 pounds. The finest specimens of the collection were purchased for the Cabinet of Berne; and, on their arrival, the cause of the dark color of the crystals was made the subject of lively discussion at the meeting of the Bernese Academy. In order to solve the difficulty, Professor Forster undertook an exhaustive and elaborate study of the whole question. His paper, covering twenty-two octavo pages has just been published in a supplementary number of Poggendorff's *Annalen;* and, without going into the details of his method of research, we give below the results at which he has arrived.

1. The coloring matter of smoky quartz is disposed in more or less regular figures, which display the hexagonal structure of the crystals.

2. The specific gravity of the black quartz is 2·65027.

3. After exposure to a strong heat, the density is 2·65022.

4. The color of smoky quartz is due to organic matter containing carbon and nitrogen.

5. This organic matter is entirely decomposed by heat, and yields, by dry distillation in a current of hydrogen, pure carbonate of ammonia.

6. The dark color disappears on the application of heat.

The results at which Professor Forster arrives will be the subject of considerable discussion in the scientific world, as they seem to point out the organic and aqueous origin of quartz rather than to its igneous irruption, as a majority of geologists have maintained. The almost simultaneous publication of the investigations of Friedel and Crafts on the organic compounds of silica, and the conclusions of Professor Wurtz, published last year in this journal, will be read with renewed interest, now that the subject is attracting so much attention. It would be strange indeed if we were to look to life and organic growth for the source of our sandstones and sand banks. And yet, under present appearances, it is not at all unlikely that we shall be compelled to do so. We have observed in the Berkshire sand, employed in the manufacture of the best crown glass, that innumerable black specks were scattered through it, which we took to be oxide of iron; but we were informed by the director of the works that they were organic and wholly destroyed by heat, thus obviating the necessity of adding manganese to neutralize them. It would be interesting, in this connection, to see if the black sand of the West does not also owe its color to organic matter, instead of to iron as has usually been supposed. The fact could be easily determined by exposing a quantity of the material to a sufficiently high heat.

RAVAGES OF THE BOMBARDMENT OF PARIS.

M. Secretan, the well known manufacturer of philosophical instruments, writes as follows to Abbé Moigno:

"As you know, without doubt, since I have communicated the circumstance to a number of persons, I have also cruelly suffered by the bombardment. On the 9th of January, at 7 o'clock in the morning, a large bomb fell and burst in my workshop in the *Rue Mechain.* The furniture was much damaged, and a considerable quantity of astronomical instruments, photographs, and optical glass was entirely destroyed.

"The damage amounted to from 18,000 to 20,000 francs. Fortunately my dividing engine was uninjured, my optical plane, for the construction of astronomical objectives according to Foucault, also received no harm; and I must confess that, considering the risk I ran, I am quite satisfied to have escaped as well as I did."

HYDRATE OF CHLORAL.

The hydrate of chloral, which in 1869 cost eighty dollars a pound, so that each sleep produced by it could be reckoned at one dollar, is now advertised on the list of a German chemical factory at about two dollars a pound. Such an enormous reduction in the price of a chemical product in so short a time has rarely occurred. Perhaps the only parallel case is metallic sodium, which, a few years ago, could not be had for two hundred dollars a pound, but can now be made for seventy-five cents. According to Dr. Richardson, the secret use of chloral in England has become so great that the victims must be put in the same class as the opium eaters. In proof of the enormous consumption, he states that, during the last year and a half, four dealers have sold forty tuns, sufficient to give narcotic doses to 36,000,000 people—in other words, every person in England could have had one good sound sleep out of the amount sold. In reference to the *maximum* dose that it would be safe to take, Dr. Richardson puts the amount at one hundred and twenty grains; he regards one hundred and eighty grains as likely to prove fatal. He also warns against the gradual increase of the dose, as its effect upon the organism is just the opposite of opium, the system, in fact, becoming more sensitive the longer it is used.

SOUTHERN LIGHTS.

We have all heard of the northern lights, or *aurora borealis*, but we are not in the habit of reflecting that the same phenomenon is to be seen in the southern hemisphere, where it is called the southern light. In order to establish a relation between the magnetic disturbances in the north and south, and to prove that there is a perfect coincidence and simultaneousness in the auroral light of the two hemispheres, Professor Heis, of Munster, has entered into a correspondence with the directors of observatories at various stations in Australia and the East, and has been able to collect much interesting and novel information, which may serve as data in the solution of the question of the probable origin of this class of phenomena.

From records kept in 1870, it appears that the aurora of the 8th of January was observed at the same time in Oxford, Liverpool, and Melbourne. Magnetic disturbances were noted, on the 4th of January, in Melbourne, Rome, and various stations in France and England. The southern light of February 1, in Melbourne, was the northern light, at the same time, in Paris, London, Königsberg, Stockholm, and other European cities. March shows several instances of similar coincidence in magnetic and auroral phenomena. Some months were exceedingly rich in simultaneous auroras, and there was not a month in which coincident observations were not made. It adds very much to the grandeur of these phenomena to know that they are visible at nearly the same moment entirely around the globe, and, as soon as we have a long series of observations, we shall be better able to give a rational explanation of their probable origin.

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