An Instrument for Measuring Hearing Capacity.

At the *conversazione* held by the Cambridge Medical Graduates' Club, at the Marlborough Rooms, London, Feb. 29, Mr. Dalby lent for exhibition an instrument, the accuracy of which many of those present had the opportunity of testing. We subjoin the description:

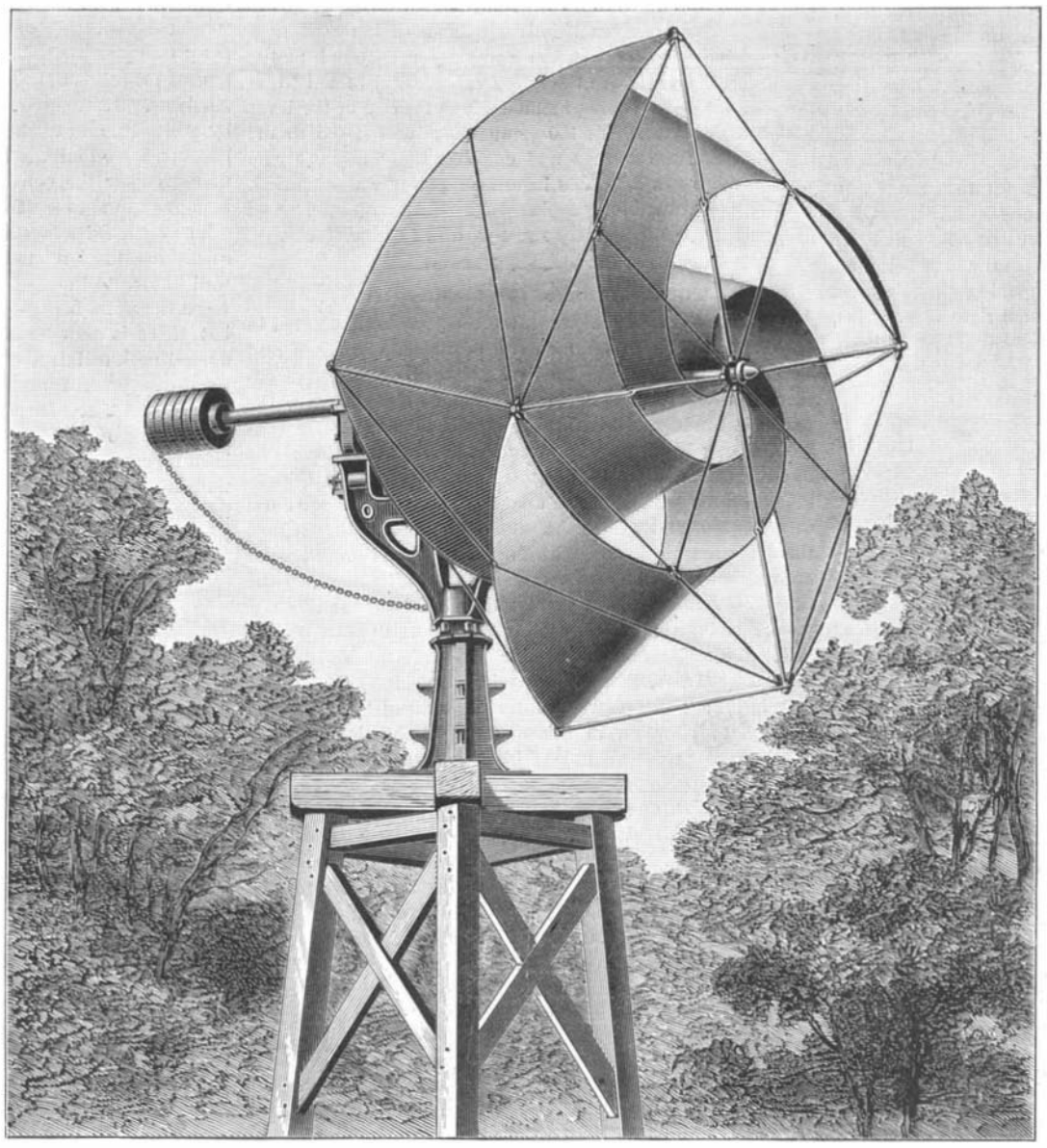
"Professor Hughes invented this instrument to be used with the induction balance as a scale of sound for comparison with it. During the past twelve months I have made use of it for the purpose of measuring variations in hearing power, and registering such variations with absolute accuracy. The registration can be made with perfect facility by the patients themselves. The telephone being applied to the ear, the patient can move the sliding coil from left to right until the clock movement can be heard. The point can then be registered in millimeters, which are 200 in all. It is an electrical instrument, and is used in connection with the telephone. The nature of its construction is as follows:

"At each end of a wooden bar divided into millimeters a flat wire coil is fixed, and a similar coil is mounted on the bar, capable of being slid from one coil to the other. One of the end coils is much smaller than the other two, in order to shorten the scale. To the middle coil the telephone is attached; the battery (in the circuit of which is a microphone) and clockwork for making and breaking the circuit are in connection with the two end coils. The wire on the said coils is wound in the reverse direction, so as to produce a neutral point between the coils. The middle coil being slid upon the bar, currents are induced in it relative to its position between the coils, its maximum point being next to the large coil, and its silent position near the small coil. The position of the coil is read off by figures on the scale. The electric currents are of short duration, being produced at the moment of making and breaking the circuit by the clockwork. One cell is sufficient to work the apparatus. It is advisable to put the clockwork at some distance from the sonometer, that the noise from the wheels running may not interfere with the sounds in the telephone."

THE ATMOSPHERIC TURBINE.

The accompanying engraving (from *La Nature*) represents a new form of wind motor called by its inventor, Mr. A. Dumont, an atmospheric turbine. The principal value of this apparatus lies in the form of the sheet iron sweeps that store up the power of the wind, these possessing the remarkable property of revolving more rapidly under the action of a slight breeze than under that of a strong wind. For example, when one of these motors, free from all constraint, is actuated by a breeze of two meters per second, its driving wheel runs at the circumference at the rate of four meters per second, a velocity double that of the wind. When actuated by a wind of ten meters per second, the same wheel acquires a velocity of eleven meters only, or one about equal to that of the wind. In this, the apparatus forms an exception to the general rule, which is that all known windmills revolve with a velocity proportional to and thrice that of the wind, that is to say, with so great velocity that during gales they must be stopped in order to prevent them from breaking.

The turbine under consideration owes to such a property the sensitiveness of its wide spread of sail to the least breeze; and to it, likewise, it owes its excellent performance during those strong winds that alone possess true power, while all other wind motors have to be stopped in order to prevent them from being destroyed. According to data furnished by the inventor, it appears that this turbine possesses a mean motive power triple that furnished by any similar motors that have hitherto been employed.



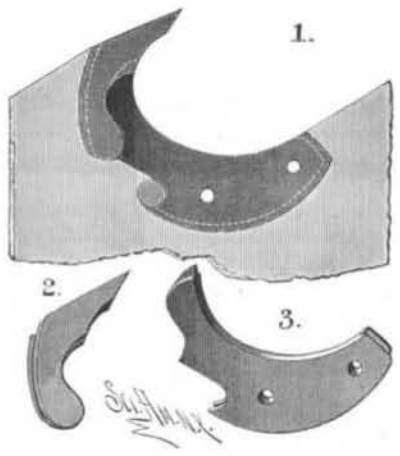
THE ATMOSPHERIC TURBINE.

Resemblance of Boron Compounds to those of Acetic Acid.

Prokofjew presented a paper to the Russian Chemical Society in November last, in which he pointed out certain curious analogies between the acetic acid residue (C_2H_3) and boron. Beginning with anhydrous boracic acid (B_2O_3) and acetic acid ($(C_2H_3)_2O_3$), he showed that each was really a sesquioxide; that borax ($Na_2B_4O_7$) corresponds to a compound obtained by combining acetic anhydride with potassium acetate, ($K_2C_2H_3)_4O_7$); while the boride of nitrogen (BN) represents acetonitrile (C_2H_3N).

SAW TOOTH.

The accompanying engraving represents an invention recently patented by Mr. R. W. Kellen, of Albion, Cal. Fig. 1 is a side view showing the tooth and shank in place; Fig. 2 is a perspective view of the tooth, and Fig. 3 shows the shank. The back of the tooth is curved and grooved, as usual, but the front is made in the ogee form, the shank being made to correspond; and as the inner end is wider than the central portion, the possibility of its flying out is prevented so long as the shank remains in place. A long and strong nib on the shank enters a groove in the tooth and holds it securely against being pressed out laterally by the file. A



KELLEN'S SAW TOOTH.

groove extending along the back and end of the shank fits on a rib in the saw plate.

An oval rivet is placed in an oval-shaped hole formed between the shoulder of the shank and the spur of the plate; a quarter turn of the rivet draws the shank firmly down to place, and tightly secures the tooth. The rivet is held in place by upsetting. By this construction the tooth is held firmly, and by making the joint between the tooth and shank a reversed curve, the centrifugal action of the tooth causes its gradually curved inner end to wedge up between the upper end of the shank and saw plate, thereby automatically tightening itself.

M. PASTEUR and his collaborators have announced to the French Academy of Sciences the fact that by inoculation they can render all dogs absolutely proof against the effects of rabies, in whatever way or quantity the virus may be administered.

An Invention that was "Not" Patented.

Sir Henry Bessemer had made several inventions before he commenced the investigations that led to the completion of the Bessemer converter. One of these inventions was the manufacture of bronze powder. This was selling in England in 1840 at about $28 per pound, while the raw material cost only 22 cents a pound. The manufactured article came from Germany, and how it was made was not known in England. Young Bessemer set to work to manufacture the powder by machinery, and, after two years' persevering effort, succeeded. In order to obtain all the advantage possible from his invention he determined to keep it secret, and therefore sent sectional drawings of the machinery needed to different engineering works, thus obtaining the parts piecemeal from different portions of England. This machinery he put together himself—a work that occupied him nine months—and then engaged confidential assistants, paying them high wages on condition that everything was to be kept strictly secret. His five machines, thus started, produced as much as sixty skillful operatives could by the old methods.

To this day the mechanical means by which this famous gold paint is produced remains a secret. The machinery is driven by a steam engine in an adjoining room, and into the room where the automatic manufactory is at work none but the inventor and his assistants have ever entered. When a sufficient quantity of work is done, a bell is rung to give notice to the engineman to stop the engine, and in this way the machinery has been in constant use for over forty years without having been either patented or pirated. Its profit was as great as its success. At first he made 1,000 per cent profit; and though there are other products that now compete with this bronze, it still yields 300 per cent profit. "All this time," says the successful inventor, thirty years afterward, "I have been afraid to improve the machinery, or to introduce other engineers into the works to improve them. Strange to say, we have thus among us a manufacture wholly unimproved for thirty years. I do not believe there is another instance of such a thing in the kingdom. I believe that if I had patented it, the fourteen years would not have run out without other people making improvements in the manufacture. Of the five machines I use, three are applicable to other processes, one to color making especially; so much so that notwithstanding the very excellent income which I derive from the manufacture, I had once nearly made up my mind to throw it open, and make it public for the purpose of using part of my invention for the manufacture of colors. Three out of my five assistants have died, and if the other two were to die and myself too, no one would know what the invention is."

Since this was said, in 1871, Sir Henry has rewarded the faithfulness of his two surviving assistants by handing over to them the business and factory.

A Model of the Eads Ship Railway.

As an aid in getting the capital to build the Tehuantepec Ship Railroad, Capt. Eads is having a working model made to illustrate in detail the devices needed for raising and lowering ships at the harbors, and distributing their weight on the wheels of the cranes on which the ship will rest during its transit across the isthmus. The *Railroad Gazette* mentions this as a convenient method of explaining contrivances to non-professional persons, but one from which the engineer can seldom gain much information as to the feasibility of the methods used when applied to a gigantic and complicated structure. The model will also show the method of side tracking the loaded cradles and the means by which the direction in which the traveling cradles is changed by turn tables instead of curves. The ship will be 7 feet long and the cradle 76 inches. The floating dock will be 90 inches long and 30 inches wide, and the basin in which it floats will hold about 500 gallons of water.

According to the latest surveys, the heaviest gradient on the Atlantic side does not exceed 42 feet per mile, while that on the Pacific is only 52 feet for about eight miles, and the remainder of the route will have no grades exceeding 26 feet per mile. It is said that no exceptionally heavy work will be encountered either in cuts or embankments, and the entire road from the Coatzacoalcos River to the Pacific harbor will be only 134 miles long.

Society of Amateur Photographers of New York.

Under the above title a new photographic association has lately been organized in this city; and if we may judge from the numerical strength and varied talents of the membership, the society has before it a very interesting and useful career. It embraces people of literary pursuits, editors, lawyers, scientists, clergymen, bankers, merchants, etc. It is evident that a very little effort on the part of such members would give spirit and interest to the general proceedings. The meetings are to be held monthly. Good rooms are to be provided, with library, fine instruments, and laboratory specially arranged for photographic experimental purposes; the latest and best processes and improvements in the art will be exhibited and explained; adventures and experiences related, new pictures by members thrown upon the screen; exchange of pictures by mail arranged; reports of proceedings prepared for publication, etc.

All who are interested in photography and its innumerable applications in practice will enjoy many advantages from membership. A local name has been adopted simply to fix the permanent headquarters of the society; but the membership is by no means intended to be local. Amateur photographers residing in any part of the country, both ladies and gentlemen, may become members on payment of the annual dues, $5.00 a year. For this purpose the secretary of the society, Mr. C. W. Canfield, 1321 Broadway, New York, should be addressed. The other officers are Mr. F. C. Beach, president; Mr. W. H. Gilder, vice-president; Mr. J. S. Rich, treasurer.

The recent improvements in photography have almost revolutionized the art, and greatly increased the number of amateur photographers. The old, sloppy, wet plate system has almost passed away; the finest pictures are now taken by means of dry sensitive plates. With a supply of these in hand and a light camera, the lover of nature, wherever he goes, may instantly secure the image of the landscape or other object that attracts his fancy. For the amateur the practice of this art is overflowing with advantages. Not only is the taste for beauty insensibly increased and the mind expanded, but subjects for study and conversation originated; better than all, physical health and strength are gained by the delightful exercise in the open air which picture taking requires.

Tin Casing to Retard Flames.

The principal cause of the rapid spreading of flames in modern buildings is found in the fact that the elevator shafts furnish such perfect flues for making a strong draught. When, added to this, these openings through the floors of a building, from top to bottom, are incased with wood, alone forms the partition walls separating such a flue from the different stories, it will be readily seen that we have a surprisingly perfect arrangement for the quick spreading of a conflagration from cellar to roof. A cheap and easily obtainable means for partial protection from this danger, in buildings where the most improved construction has not been followed, would be to line the elevator shaft and the connecting doors and casing, as well as the car, with tin. This would not, of course, make these openings proof against the action of a fire which had been some time in progress, where the accumulated heat would be like that of a furnace, but it would interpose a measure of protection which would effectually check a fire in its initial stages, and prevent the sudden flashing into a blaze, through this channel, of all the floors at a time of a great store or warehouse. This is a precaution which may be taken with so little trouble and expense that it is worth the consideration of every owner or occupant of a building where the elevator shaft is of the old style of combustible construction.

The Art of Thinking.

The object of the teacher is to teach to think. The pupil thinks enough, but he thinks loosely, incoherently, indefinitely, and vaguely. He expends power enough on his mental work, but it is poorly applied. The teacher points out to him these indefinite or incoherent results, and demands logical statements of him. Here is the positive advantage the teacher is to the pupil.

Let us suppose two pupils are studying the same lesson in geography or grammar or history. One reads to get the facts; he fastens his eye on the page and his mind to the subject before him; he makes the book a study and acquires information from it; his object is to acquire knowledge. He attains this end. The other also studies the book, but while reading he is obtaining lessons in thinking. He does not merely commit to memory; he stops to see if the argument is sound, he analyzes it to see if the conclusion is warranted by the premises.

The one who thinks as he reads is quite different, it will be seen, from him who simply learns as he reads. To read and think, or to think as one reads, is the end to seek. To teach to think is then the art of the teacher. The reader for facts gets facts; he comes to the recitation seat and reels off those facts. His mind, like Edison's phonograph, gives back just what it received. While this power is valuable, it is not the power the world wants.

The teacher will find his pupils come to the recitation to transmit the facts they have gained. He must put them in quite another frame of mind. Instead of recitations they must be made into thinkers. The value of the teacher is measured by his power to teach the art of thinking.—*Teacher's Institute.*

Steam Boiler Accidents.

In giving a summary of the number of boiler explosions in this country in 1883, the *Locomotive* says that "the number of recorded explosions reaches a total of 184, by which 263 people were killed outright, and 412 injured. As many of the latter were reported fatally injured at the time of the explosion, it is probable that the number of deaths considerably exceeded 263. This reckless waste of human life is entirely unnecessary, and might be, to a great extent, prevented by the exercise of even ordinary care and prudence."

The concluding sentence is remarkable: "This *reckless* waste of human life is entirely unnecessary, and might be, to a great extent, *prevented* by the exercise of even *ordinary care and prudence.*" This is strong language, but it is not the unthinking and intemperate outburst of some indignant engineer who is angered at the belittling of his business by pretenders. It is the calm, published statement of a responsible company which keeps a corps of competent men examining boilers, and lives by warranting the life of boilers, or paying for the damage done by their explosions—the Hartford Steam Boiler Inspection and Insurance Co. If this "reckless waste of human life" is in any degree preventable by "the exercise of care and prudence," it is time that some care and prudence were exercised by the legal authorities.

There is, in some States, a superficial examination of engineers to determine their qualifications so far as to ascertain if these are sufficient to give them control of an engine (and presumably a boiler). But even this examination is of the most flimsy sort, if the experience of the writer is a specimen; and as for firemen, any man who can shovel coal and wheel ashes fills that bill, generally. But in most places and cases there is no other recommendation for an engineer and a fireman but that of cheapness. In fact, there are engines and boilers run in our cities without either engineer or fireman.

An economical firm recently put in a boiler and a second-hand engine, having previously hired power. On a visit to the new establishment the boiler was found in a dark cellar, and to see the pump a kerosene lamp had to be lighted. This establishment had no engineer nor coal heaver. When the speed went down somebody was sent to stir up the fire, and, as the principal of the firm said: "We pump in water twice a day." The boiler had a glass gauge and two gauge cocks, but the glass was opaque from dirt, and the lower gauge cock could not be opened by ordinary hand force—it had rusted (oxidized) in its seat.

The *Locomotive* gives a similar instance of ignorant neglect: A boiler insured in the company was found at the first quarterly visit with the safety valve so "jammed" that it could not be moved by manual lift at the end of the lever with a boiler pressure of 100 pounds. It was stated to the inspector that the fireman and engineer was "any one who wanted more steam." The insurance policy was canceled. Not long afterward an "accident," happily without loss of life, compelled a temporary shutting down of the works.

The Inventor of the Locomotive.

A beautiful memorial window has just been erected in Newburn church to the memory of the late William and Thomas Hedley, the one the inventor of the locomotive engine, who was born at Newburn, and the other his son, the practical founder of the Bishopric of Newcastle. The subjects chosen by the artist are "Noah and his three sons building the ark," illustrating the genius given by God to man, and the parable of the talents, typifying the good use of the genius and wealth that man is blessed with. Above the first group is a scroll with the text, "And thus did Noah according to all that God commanded him," and above the other, "Well done, thou good and faithful servant." The work has been executed by Mr. W. H. Atkinson, of this city. At the base of the window is a large brass plate, engraved by Mr. A. Reid, of this city, bearing the following inscription: "The above window is dedicated by William Hedley, of Newton, in this country, to the glory of God, and in loving remembrance of his relatives interred in the adjoining churchyard, amongst whom are his father, William Hedley, of Newton and of Burnopside Hall, near Lanchester, Esquire; and his brother, Thomas Hedley, barrister-at-law, also of Newton, Esquire. By the inventive genius of the former, the locomotive engine was first brought into successful operation, A.D. 1812 and 1813, at Wylam; and chiefly through the munificent bequest of the latter the Bishopric of Newcastle-on-Tyne was created in 1882." At the bottom of the plate is the representation of a railway engine, and underneath are the words, "Drawing of the first locomotive invented by William Hedley, originally placed in Kensington Museum."—*Northern Evening Express.*

Indelible Stamping Ink.

E. Johanson, of St. Petersburg, gives the following formula for a convenient ink for marking clothing by means of a stamp: Twenty-two parts of carbonate of soda are dissolved in 85 parts of glycerine, and triturated with 20 parts of gum arabic. In a small flask are dissolved 11 parts of nitrate of silver in 20 parts of officinal water of ammonia. The two solutions are then mixed, and heated to boiling. After the liquid has acquired a dark color, 10 parts of Venetian turpentine are stirred into it. The quantity of glycerine may be varied to suit the size of the letters. After stamping, expose to the sun or apply a hot iron.

A New Cure for Cancer.

Information of one more remedy alleged to possess special virtues in curing "cancer" reaches us through a correspondent from Brazil. Dr. Ignacio Alcibiades Velloso, of Recife, Pernambuco, introduced the remedy to notice, and in a communication to the *Journal de Recife* gives his experience of its use.

He states that the plant, which is popularly known by the name of the "alvelos," belongs to the Euphorbiaceæ, and is indigenous to Pernambuco. He alleges that a magistrate who was suffering from epithelioma of the face, and who had returned to his estate despairing of relief, was entirely cured of his disease by the topical application of the juice of this plant. Dr. Velloso learning this, was induced to employ the same remedy on two patients at the Hospital Pedro II.--one a case of cancroid of the nose, the other of epithelioma of the lip—with the result that the first patient was "completely cured" in forty days, and the second in less than two months, "much to the surprise of the other professional men of the establishment." Such results, he thinks, justify a trial of the remedy, especially in uterine cancer.

The action of the juice of the plant, as others of the same natural order, is irritating, producing a spreading dermatitis without much pain; and the application of the cut stem or the juice of the fresh plant to the diseased part, is said to result in destruction of the morbid tissue, which is replaced by healthy granulations—doing the work, in fact, of the chloride of zinc paste.

Upon this we need only remark that if the remedy really possess the escharotic action described, there is less reason for doubting its efficacy in such localized morbid formations as those mentioned than there was for questioning the alleged virtues of other remedies, such as "condurango," which flourished for a time, but which were supposed to operate after they had been taken into the stomach. It is clear, however, that the use of the "alvelos" must be limited to the regions in which the plant grows.—*Lancet.*

Condensed Milk.

Several successful prosecutions have been conducted against the retailers of condensed milk in Liverpool, which the *Analyst* thinks will doubtless cause considerable consternation among the large milk condensing companies, who have up to the present time escaped the operations of the "Sale of Food and Drugs Act."

Condensed milk has been lately extensively employed in connection with what may be called a new industry, that of "milk blending," or in other words, letting down rich dairy milk, so that the analytical results agree with the figures for solids not fat prescribed by the Society of Public Analysts. Large quantities are daily consumed in this way by milkmen, and to such an extent has the trade increased that condensed milk is imported in churns, especially manufactured for the convenience of dairymen; these churns being returned to the factory for a further supply.

The difficulties of condensing rich milk, although much scientific attention has been devoted to it of late years, are well known to those engaged in the trade, more especially when the milk is preserved without the addition of sugar, but there is now no difficulty whatever in preparing condensed milk of fair average quality containing the whole of the cream present in the milk previous to condensation. The excuse that a large proportion of the fat was mechanically carried over in the operation of condensing *in vacuo* has been repeatedly proved to be erroneous. In fact, it is not unusual to add to the milk, during the first stage of concentration, clear butter fat, in order to prevent the excessive frothing which takes place and causes considerable trouble, requiring great care to prevent the milk from rising over and mixing with the condensing water.

Manufacturers of condensed milk have, therefore, no more right to deprive the milk of its cream previous to condensation than the ordinary milkman; in fact, the offense becomes in their case more serious, as, instead of declaring the article as condensed skim milk, it is described as milk, guaranteed to be pure cows' milk, and is highly recommended for invalids' and infants' diet, as being more wholesome and nutritious than fresh cows' milk, and especially milk from cows fed in cowsheds in large towns; the milk is the richest and best, the water having been abstracted and pure loaf sugar added. The heinousness of selling condensed skim milk under cover of this guarantee is obvious, more especially as the offense is not committed by a small milkman in one of the poorer districts of our large towns, but by large companies, presumably with extensive capital and controlled by educated men, who, simply for the sake of underselling, put forward an article deprived of one of its most valuable constituents, and represent it to be richer in quality than genuine milk from cows fed in cowsheds in large towns.

Analysis of Chrome Iron Ores.

The insolubility and infusibility of chromic iron render its analysis one of the most tedious. Schwarz recommends smelting the finely pulverized mineral with chlorate of potash and caustic potash, in a silver crucible. The fused mass is dissolved in water, and the quantity of potassic chromate estimated by running in a solution of ferrous sulphate, then titrating the excess of the latter with permanganate solution. The residue insoluble in water is dissolved in hydrochloric acid, and the iron titrated with stannous chloride. A good silver crucible will stand one hundred fusions.

Correspondence.

Calming the Waves with Oil.

To the Editor of the Scientific American:

In looking over some odd volumes of the *Penny Magazine,* an old London weekly, I came across a paragraph "On the effect of oil in stilling waves." This article is contained in the issue of May 28, 1842, a testimony of Sir Gilfred Lawson, "who served in the British army at the defense of Gibraltar. He relates that the fishermen of Gibraltar were accustomed to pour a little oil on the sea, in order to still its motions, that they might be enabled to see the oysters lying at its bottom; Sir Gilfred had often seen this done." . . . "Dr. Franklin was informed that many of the divers on the coast of Italy were accustomed to take a little oil in their mouths before they dived; when they had descended to a certain depth they allowed the escape of the oil, which, rising to the surface by virtue of its lightness, spread in a thin film, which smoothed the water ripples and allowed light to descend to a considerable depth. The fishermen of Lisbon, when about to return into the river, if they saw before them too great a surf upon the bar, were accustomed to empty a bottle or two of oil into the sea, to still the breakers."

Franklin thus narrates: "In 1757, being at sea in a fleet of ninety-six sail, bound against Louisbourg, I observed the wakes of two of the ships to be remarkably smooth, while all the others were ruffled by the wind, which blew fresh. Being puzzled with the differing appearance, I at last pointed it out to our captain, and asked him the meaning of it. 'The cooks,' said he, 'have, I suppose, been just emptying their greasy water through the scuppers, which has greased the sides of those ships a little!' and this answer he gave me with an air of some little contempt, as to a person ignorant of what everybody knew. In my own mind I at first slighted this solution, though I was not able to think of another."

Franklin did not drop this subject, but conversed with "maritime men" on the matter, and found that most of them knew of it. He made some experiments on Clapham pond, but found that if applied upon the leeward side of the pond, where the waves were largest, the oil was driven upon the shore. But on dropping a teaspoonful of oil on the windward side, it produced a "sudden calm over a space of several yards," until it gradually made the pond of perhaps half an acre, "as smooth as looking glass." He explains it thus: "I imagine that the wind blowing over water thus covered with a film of oil cannot easily *catch* upon it, so as to raise the first wrinkles, but slides over it, and leaves it smooth as it finds it. It moves a little the oil, indeed, which, being between it and the water, serves it to slide with and prevents friction."

A. L. R.

Fort Wayne, April 2, 1884.

Substitutes for India Rubber and Gutta Percha.

The Swiss *Gewerbe-blatt* thus discusses the subject of a substitute for India rubber. In the first place, such a substitute must be cheaper than real India rubber. There are many kinds of material that fulfill this requirement. Sulphur is one of the things that is unattacked by acids, alkalies, and salts. Its great brittleness gives place to a softness, pliability, and elasticity similar to rubber if it is poured into cold water while melted. (It melts twice at different temperatures, and it is only after this second melting that it possesses this elasticity.) It remains soft enough to be moulded for several days, and these qualities it retains permanently if it is mixed with more or less linseed oil varnish before it is poured into water.

There is no doubt that sulphur is of importance in making artificial substitutes for India rubber, and no less so as a substitute for gutta percha. The first thing is to endeavor to discover some permanently elastic substance which shall destroy that crystalline structure which makes the sulphur brittle, and render it impossible for it to return to this condition.

Next after sulphur, alumina soap deserves consideration, for it is likewise a tenacious substance that can be stretched, and it undergoes many curious changes when melted with thick linseed varnish and resin. Zingler has, in fact, patented a composition of sulphur, copal, oil of turpentine, and albumen.

Although substitutes for gutta percha may be obtained with the aid of some of these substances, it will always be difficult to imitate the elasticity of India rubber, so that its substitutes will find use only where its elastic property does not come into prominence.—*Poly. Notizblatt.*

Artesian Wells on the New Jersey Coast.

Dr. George H. Cook, the New Jersey State Geologist, describes the successful opening of artesian wells, 400 feet deep, at Ocean Grove and Asbury Park last summer, and says the character of the sand and marl found in the boring is so well marked that it may be reasonably expected to yield water for the supply of all the towns and villages on the sea coast. The water is absolutely free from contamination with organic matters, and is soft enough for laundry purposes. The well at Ocean Grove is a flowing well, yielding 60,000 to 70,000 gallons daily; it is lined with six inch iron tube for 50 feet, the bore lower down not being tubed. The water has a temperature of 60° F., and contains 8·5 cubic inches of carbonic acid per gallon.

Siphonage of Traps by Capillary Attraction.

A correspondent of the *Hydraulic Plumber,* of New York, relates a story of his employment, some time ago, to investigate the causes of a foul smell in a certain bath room, where other plumbers had worked before him in vain. The pipes had been swabbed out; the closet, an old-fashioned pan apparatus, had been burned out, and disinfectants applied in vain. The wastes of bath and wash basin, according to the old practice, entered the water closet trap, but no sign of leakage could be discovered about this or the waste pipes. The new plumber, not knowing what else to look for, removed the closet and filled the trap with water. As soon as the agitation had ceased, he measured the depth of the water, and then left it to itself for twenty minutes. At the end of that time the water level had fallen half an inch. Twenty minutes later it had fallen still more, and in an hour the seal was so far broken as to allow a slight current of sewer air to enter the room. The plumber then left the room for two hours, locking the door and taking the key with him. When he returned the place was full of foul air, and on passing his hand under the bend of the trap he found a space of about an inch and a quarter between the surface of the water and the under side of the bend of the trap.

The next step was to cut away the crown of the trap, so as to expose the upper portion of the bend. An opening was made, 4 inches long and 3½ inches wide, but examination through this showed nothing out of the way until the trap was refilled, when a wet line was observed over the bend, which proved to follow the course of some hairs, twelve or fifteen in all, which had been caught, together with some lint and ravelings, in the slimy lining of the bend. By detaching the lower part of this collection from the walls, allowing it to hang down free in the outlet pipe, the water was observed to drip from the end at the rate of 70 or 80 drops a minute. The whole was then cleared away and the closet replaced, and no more trouble was experienced.

The plumber in question then made some very interesting experiments, to ascertain the amount of conducting substance necessary to cause the emptying of traps in this way, using a small beaker glass in place of a lead trap. He found that with five pieces of No. 80 spool cotton, about 7 inches long, hung over the edge of the beaker, the water level was lowered 3 inches in nineteen hours, and ½ inch in about fifteen minutes. With five long hairs the lowering amounted to 1 inch in ten hours, and 3 inches in about a day and a half. With five hairs and two threads, of the same size as before, the lowering in seven and one-half hours was 1½ inches. One piece of cotton twine lowered the water ¾ of an inch in four and one-half hours. Two pieces of twine drew over 1 inch of water in two hours, and 2 inches in less than four hours. A bit of cotton cloth, half an inch wide, siphoned over ¾ of an inch of water in an hour and a quarter. There was apparently no difference in the action, whether the threads were submerged or floated on the surface of the water.

In the sunshine the drying of the absorbent material was so rapid as sometimes to stop the capillary action, but in the shade it went on steadily, even when the beaker was placed in a strong current of warm air. As nothing is of more common occurrence in drain pipes than lint or hair, it seems likely that this observation will explain many cases of offensive odors in bath rooms and bed rooms not otherwise to be accounted for.

Siemens, Bessemer, and the German Patent System.

It is related that the late Sir William Siemens, who was born and educated in Germany, but made England his home after his twenty-fourth year, was principally moved to change his residence from the greater security afforded inventors by the English patent law. The English patent law was not then (1844) as liberal as it now is, but the advantages thereunder were greatly superior to those afforded in Germany, where great inventions had been often refused any protection, while inventors of small mechanical improvements were allowed patents for only a short period.

The early German policy was well illustrated in the manner of treating the Bessemer process. Before Sir Henry had taken the preliminary steps to obtain his German patent, Herr Krupp had entered into negotiations therefor, and agreed to pay £5,000 for the use of the invention. The inventor accordingly sent all his papers to Krupp, who in due course applied to the Prussian Government for a patent, and was told the invention was not a new one, but that Mr. Nasmyth had made the invention previously. Mr. Nasmyth denied this, and the Prussian officials of patents then said some one else had made the invention, and they would find out in a few days who it was. This excuse continued to be made during six weeks, during which the Commissioners promised from day to day to find a previous inventor, when they finally told Krupp: "If we do not find it to-morrow, we will grant your patent." This answer was then again repeated until a week of to-morrows had passed, when, as Krupp called the last time, he was shown an English blue book, containing the publication of the English patent, and the Commissioners said: "Now, seeing it is a publication in Prussia, we cannot grant you a patent by the law of Prussia." Of course, after this answer Herr Krupp had the use of the invention without any legal obligation to make any payment to the inventor.

The Old Trade Guilds in Germany.

The late Sir William Siemens, who was born in Hanover in 1823, and received his early education at Lubeck, has thus described the manner of "learning a trade" at that time in vogue:

"When a boy at school," he says, "I was living under the full vigor of the old guild system. In going through the streets of Lubeck I saw Carpenters' Arms, Tailors' Arms, Goldsmiths' Arms, and Blacksmiths' Arms. These were lodging houses where every journeyman belonging to that trade or craft had to stop if came into the town. In commencing his career, he had to be bound as an apprentice for three or four years; and the master, in taking an apprentice, had to enter into an engagement to teach him the art and mystery, which meant the science of his trade. Before the young man could leave his state of apprenticeship he had to pass a certain examination; he had to produce his *Gesellen-stück,* or journeyman piece of work, and if that was found satisfactory he was pronounced a journeyman. He had then to travel for four years from place to place, not being allowed to remain for longer than four months under any one master; he had to go from city to city, and thus pick up knowledge in the best way that could have been devised in those days. Then, after he had completed his time of travel, on coming back to his native city, he could not settle as a master in his trade until he had produced his *Meister-stück,* or master-piece. These master-pieces in the trade were frequently works of art in every sense of the word. They were, in blacksmithy, for instance, the most splendid pieces of armory; in every trade, and in clocks above all others, great skill was displayed in their production. These were examined by the Guild Masters' Committee, and upon approval were exposed at the Armsof the Trade for a certain time, after which the journeyman was pronounced a master; he was then allowed to marry, provided he had made choice of a young woman of unimpeachable character. These rules would hardly suit the taste of the present day, but still there was a great deal of good in those old guild practices." This system was abolished in Germany in 1869, but the stimulus it afforded to excellence of workmanship appeared to have made an early and lasting impression on his mind.

Rusting of Iron and Steel.

M. Gruner has lately published in *La Metallurgie,* the results of a year's researches into the comparative oxidizability of cast iron, steel, and soft iron, under the influences of moist air, sea water, and acidulated water. Having done justice to the earlier labors of Mr. Robert Mallet, of Dublin, and Messrs. Phillips and Parker, of London, he explains the arrangements made to secure a perfectly fair trial. The following results were obtained. The experiments with moist air are still proceeding; but so far, it was found that in twenty days the steel plates lost from 3 gram. to 4 gram. for every two square decimeters of surface. Chrome steel rusted more, and tungstated steel less, than the ordinary carbureted steel. Cast iron lost only about half as much as the steel, and spiegeleisen less than gray iron. Sea water dissolves iron rapidly, and acts upon it more powerfully than on steel, most powerfully of all upon spiegeleisen. In nine days the steel plates with 2 square decimeters of surface lost from 1 gram. to 2 gram., while the Bessemer metal lost 3·5 gram., phosphorized iron 5 gram., and spiegeleisen 7 gram. Tempered steel was less affected than the same steel twice annealed, soft steel less than chrome steel, and tungstated steel less than the ordinary steel with the same proportion of carbon. It is evident from these experiments that manganese sheets ought not to be used on the hull of a vessel. Acidulated water dissolves cast iron much more rapidly than steel but not spiegeleisen.

A New Fire Tank.

Several large fires in the lower part of New York city have demonstrated that the supply of water from the hydrants is insufficient for the purpose. To overcome this evil one of the Fire Commissioners has invented an apparatus which seems to be well adapted to its work, where circumstances require and conditions permit its use. The device consists of a large tank, mounted on wheels, which is supplied with water pumped from fireboats situated in the river. In the trial the tank was placed a mile away from the boat, and the two were connected by hose. The pumps of the fireboat threw water into the tank without trouble, and the fire engines drew from the tank as successfully as from a hydrant.

The Patent Bills Analyzed by "Puck."

"The Register" in *Puck* dissects the patent bills now before Congress, and draws the following apt conclusions and illustrations: "If these bills go through, the next edition of Webster's Dictionary ought to define 'Legislation' as 'robbery by representatives.' Suppose a bill were introduced to shorten the term of all railroad company charters to five years—a melodious outcry there would be, wouldn't there? But rob the inventor of a patent car wheel of twelve years' profit on his invention, and you find only six men in the House of Representatives to see the iniquity of the proceeding—six out of one hundred and twenty voting. Truly, the age of pure reason has not dawned yet; and there is not so vast a distance between prehistoric man and the dude as the dude's shirt collar would imply."