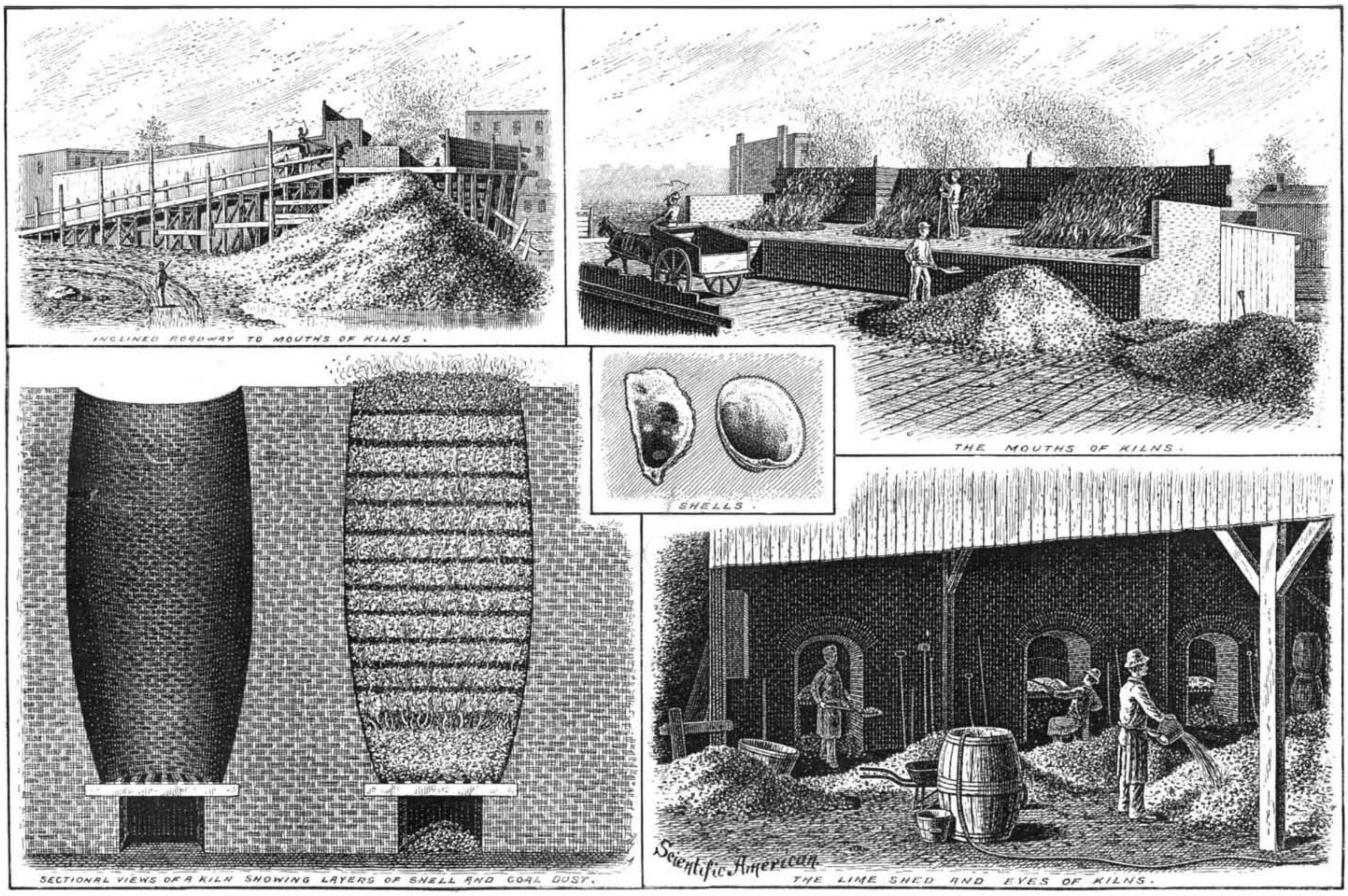
A DRAW SHELL LIME KILN.

The consumption of oysters and clams in the city of New York is enormous. The waters of the various bays and inlets in the vicinity of the great city are noted for the superior excellence of these bivalves, for which there is here at all times a ready market. The mere labor of removing the empty shells and their subsequent utilization forms a large industry, in which hundreds of people with horses and carts are employed. This industry embraces the operation of a number of lime kilns, in which the refuse shells are reduced to that useful product, quicklime, which commands a ready sale. Our present illustrations are taken from the plant of Murray & Byrne, Jersey City, N. J., opposite New York. The kilns are egg shaped and made of brick, 3 to 4 feet in thickness, being lined inside with fire brick. The kilns are 25 feet in depth, 10 feet in diameter at the top, down to about 6 feet at the bottom. Each kiln when filled contains about 14 cart loads of shells. The kilns are first started with coke fires. A layer of shells is first placed on the coke, and then a layer of coal dust. This is repeated until the kilns are full. The coke fire at the bottom causes the first layer of shells to become red hot. This in turn sets fire to the layer of coal dust and up and through the next layer of shells, the flames gradually creeping up through the different layers until they reach the top. The kilns are then drawn off. This is done by pulling out the iron bars or grate at the bottom or eye of kiln. As soon as the bars are drawn out the burnt shells drop down, if not obstructed by clinkers, and carried away to be slaked. This is done by pouring a little water on to the burnt shells, which in a few moments turn into powdered lime. Large clinkers sometimes prevent the shells from lowering evenly. This is remedied by passing a long iron bar down along the sides from the top of the kiln. As soon as the burnt shells are lowered, bringing the fire to the eye of the kiln, it is again filled up with layers of shells and coal dust, going over the same process as before. These fires are not allowed to go out only in case of repair. It requires about 70 hours to burn one kiln of shells. This lime is used mostly in purifying gas. It is also used in soaps and for fertilizing purposes. The draw kilns are a great improvement over the old way of letting out the fires every time they were drawn. The new shape allows the kilns to be drawn and refilled with the fires constantly burning. The shells are carted up to the top of kilns by means of an inclined roadway running along the side of the works. The shells are dumped on the platform and shoveled into the kilns. The cost of this plant is about $3,000.

The carts used are larger than the common cart, and hold about 35 bushels. Each kiln holds between 550 to 600 bushels of shells. A cart load of shells weighs about 2,240 lb. Each full kiln will pan out about 630 bushels of slaked lime, or about 210 barrels. The shells come mostly from the markets of New YorkCity. They are collected by carts. In some places they get their shells for nothing, and in others they pay a trifling sum yearly. The lime sells at 8c. per bushel slaked and 15c. unslaked. The purchasers of this lime are gas companies, soap manufacturers, and farmers. There are about seven firms in New York City and Brooklyn, and they turn out from 12,000 to 13,000 bushels daily, or about 4,000,000 to 5,000,000 bushels yearly. There is about 1 load of coal or coke dust to every 4 or 5 loads of shells. The coal or coke dust costs about $1 per load. Sometimes they get it for nothing. Three men can do all the work around three kilns. There is no particular distance between the layers of shells, sometimes about a foot and sometimes less.



SHELL LIME KILNS NEAR NEW YORK.

Fixation of Nitrogen by Plants.

Of the various elements with which it is necessary to supply the soil in order to insure its fertility, nitrogen, says the *Gardeners' Magazine*, is the most costly, and as it forms nearly four-fifths of the air, it is not surprising the question as to the fixation of free nitrogen by plants has long occupied the attention of agricultural chemists. Toward the end of the eighteenth century Senneber and Woodhouse expressed the opinion that free nitrogen was not assimilated by plants, and in this view they were some years later confirmed by Saussaure, who from exhaustive experiments concluded that nitrogen was obtained from soluble organic matter in the soil and ammonia in the atmosphere. Boussingault, who began to investigate the matter in 1837, continued his investigations for a period of twenty years, with the result that he arrived at the conclusion that plants do not assimilate free nitrogen. On the other hand, Ville believed, from the results of his experiments made during 1849 and three following years, that plants are able to assimilate free nitrogen, and he was confirmed in his belief by a repetition of his experiments in 1855 under the direction of a committee consisting of the leading French chemists of that day. In 1857, experiments were commenced by Messrs. Lawes, Gilbert, and Pugh, at Rothamsted, and continued for several years, with the result, as stated in the memoir contributed to the *Transactions* of the Royal Society in 1860, that they arrived at conclusions which fully supported the conclusions of Boussingault.

Of late years renewed interest has been evinced in the subject, and of the recent experiments those of Hellriegel and Wilforth are the most important, as they show that, although the higher plants may not directly utilize free nitrogen, some of them may acquire nitrogen brought into combination under the influence of lower organisms. The results were regarded by Sir James Lawes and Dr. Gilbert as of such far-reaching importance, in their bearing on the admittedly unsolved problem of the source of the whole of the nitrogen of leguminous crops, that they decided to again take up the question. Accordingly, experiments were commenced at Rothamsted, and are still in progress, and the report contributed to the current issue of the *Journal* of the Royal Agricultural Society by these eminent investigators is of great importance. In their able paper entitled "The Sources of the Nitrogen of our Leguminous Crops" they adduce a large mass of evidence as to the manner beans, peas, clovers, and other leguminous crops obtain nitrogen from the air. Upon the roots of these plants wart-like nodules are formed, and these nodules are the dwelling places of certain lowly organisms, or microbes, which have the property, not possessed by the higher plants, of taking up the nitrogen from the air within the soil, and of presenting it to the higher plant in such a form that the latter can assimilate it. The microbes are not regarded as strictly parasites upon the roots of the Leguminosæ, because they are serviceable to those cultivated plants; hence the association of the two is described by the name symbiosis, or a living together. From the newly recognized source of the nitrogen of our leguminous crops it is possible that results of great practical importance may be obtained.

Weeds Wanted for the World's Columbian Exposition.

Almost everybody wants to get rid of weeds, but here is a man who makes a strong appeal to be supplied with them. It is the botanist, Prof. Byron D. Halsted, of the New Jersey Agricultural Experiment Station, New Brunswick, N. J.

He says: "In order that the exhibition of weeds at the World's Columbian Exposition may be large, and representative of all sections of the country, the undersigned (having this feature in charge) respectfully asks for specimens of the worst weeds from all States and Territories.

"The collecting must all be done during the present season, and the specimens sent in for mounting, labeling, etc., by December 1, 1892."

CANADA has been given 68,471 square feet of space in the various buildings, exclusive of space yet to be granted in the agriculture and live stock departments.

A Talk with Edison.

In the New York *World* of January 17 appeared a long interview with Edison. Although written in the extravagant style which characterizes the daily newspaper allusions to this inventor and his achievements, portions of the article are very interesting. For instance, Mr. Edison was asked how electricity could be called into service in case of a war with Chile.

"That," said he, "I want to talk about. It is true I have invented an electric torpedo, the Sims-Edison torpedo, which we have sold out to the Armstrong Gun Company. It is a very fine thing. It is put on a wire, as of course you understand, and moved by electricity. It can be run out two miles ahead of a man-of-war's bow and kept at that distance ready to blow up anything in reach. It is a very pretty and destructive toy. But it is not in that kind of thing that I take pride. What I want to see is some foreign nation coming to this country to attack us on our own ground.

"That is what I want to see, and I think that electricity will play such a part in war when that time comes it shall make gunpowder and dynamite go sit in humble obscurity with the obsolete flint arrowhead and call him brother. Every electrician, when that time comes, will have his plan for making the life of his enemy electrically uncomfortable. Here is one item of defense which I have in mind.

"It is simple as A B C. I have never spoken or written about it before. With twenty-five men in a fort I can make that fort absolutely impregnable so far as an assault is concerned, and I should only need twenty-five men in the fort to do it. This is not guesswork, but a matter of absolutely scientific certainty. In fact, twenty-five men would be a very liberal garrison. Some years ago, when the wires loaded with heavy electric charges began to go up everywhere, I predicted that there would be danger of the firemen receiving deadly shock by the electricity running down the streams of water which might cross the wires. The insurance people laughed at the idea. But I tried it on a cat, and the cat and I found my theory to be true. That is to say I did, and the cat found it out if there is another world for cats. He never knew anything about it in this world.

In each fort I would put an alternating machine of 20,000 volts capacity. One wire would be grounded. A man would govern a stream of water of about four hundred pounds' pressure to the square inch, with which the 20,000 volts alternating current could be connected. The man would simply move this stream of water back and forth with his hand, playing on the enemy as they advanced and mowing them down with absolute precision. Every man touched by the water would complete the circuit, get the force of the alternating current, and never know what had happened to him. The men trying to take a fort by assault, though they might come by tens of thousands against a handful, would be cut to the ground beyond any hope of escape. Foreign soldiers undertaking to whip America could walk around any such fort as mine, but they never could go through it. It would not be necessary to deal out absolute death unless the operator felt like it. He could modify the current gently, so as simply to stun everybody, then walk outside his fort, pick up the stunned generals and others worth keeping for ransom or exchange, make prisoners also of the others if convenient, or if not convenient turn on the full force of the current, play the hose once more, and send them to the happy hunting grounds for good."

The picture raised by Mr. Edison is certainly a most beautiful and attractive one. It is nice to think of all the fine descriptive matter that could be written. Such a fort and such a warfare as Mr. Edison has planned would make old-fashioned generals and M. Detaille, of battle scene fame, turn in their graves. We should have infantry moving on forts at a quickstep, dressed all in rubber, with chilled glass soles to their shoes and non-conductor handles to their swords and guns. Generals would look much funnier than a picture from *Punch*, charging at the head of their armies riding on horses shod with rubber arctics, the generals themselves carrying large rubber umbrellas, with gutta-percha handles, over their heads.

The world owes a great deal to Mr. Edison for the things he invents, and for the ease with which he gets out of the commonplace and makes life worth living. This fact was pointed out to Mr. Edison, and then this question was put to him:

"The world owes you a great deal. How much has it paid you for the work you have done?"

Mr. Edison laughed.

"Oh, I don't know," said he. "Probably as much as the world thought it was worth."

"Mr. Edison, some people think you have made untold millions. Incidentally they are glad if you have. Others say you have not made much of anything. That most of the money your inventions produce goes to make other gentlemen fat and happy. Could you take the trouble to go carefully with me over all your inventions, make an estimate of the amount of money which they produce, and give me some idea as to what share you got out of that wealth?"

Mr. Edison thought he could. First he wrote down the following list of his inventions, which, as he said, were his commercial inventions; that is to say, those which by returning a profit had proved their own success.

As he made the list he made comments on the various inventions, and that list is interesting, because, written in his own handwriting, it gives his own estimate of his personal share in the various electrical inventions with which his name is connected.

District Telegraph.—"Of that I am one-half inventor."

Quadruplex System of Telegraphy.—"That is my invention."

Stock Ticker.—"Of that I am one-half inventor."

Telephone.—"One-half my invention."

Electric Pen and Mimeograph.—"My invention."

Incandescent Lighting System.—"My invention."

Electric Railroad.—"I am one of the inventors of that."

Phonograph—"My invention."

"The district messenger service is in use in 600 cities and towns in the United States. The investment amounts to about $4,800,000, paying about 5 per cent. The system employs about thirty thousand persons, averaging $1 a day salary.

"The quadruplex system of telegraphy is in use on 72,000 miles of Western Union wire. Eleven years ago the Western Union reports stated that the quadruplex system saved $560,000 in interest and repairs. Inasmuch as every mile of wire actually built does the work of four miles of wire, the quadruplex system represents 216,000 miles of phantom wire, worth $10,800,000.

"On these $10,000,000 worth of wires there is no repairing to be done. The value of those phantom wires is, therefore, represented by a saving of $860,000 in repairs at $4 a mile annually, besides the interest on the $10,800,000 which it would have taken to build them. Three thousand men work on my duplex instruments."

"Mr. Edison, how many millions do you make out of the millions which that invention of yours creates?"

"Not many. I sold the system to the Western Union sixteen years ago for $30,000, and spent the whole of it in experimenting in trying to make a wire carry six messages instead of four. I didn't succeed. So that financially I am worse off than I would have been had I never invented the quadruplex system."

"How about the stock ticker?"

"That employs about five hundred men at work and represents an investment of $8,000,000, paying about 5 per cent a year. From that invention I have received at different times $50,000. I spent $60,000 in getting the thing up. That again was a loss."

"Now for the telephone, Mr. Edison. Everybody supposes that you and Prof. Bell have millions stowed away, made on your telephone inventions."

"Bell invented the receiver. That is the end of the telephone which you put to your ear. He was trying to use that simultaneously as a transmitter, but could not make it go. The thing, therefore, did not pay. I invented the carbon transmitter, which made the telephone a financial success by making it commercially available. Here are the financial figures on the telephone, which really stagger me now that I come to look them up. Throughout the world there are at least one million telephones in use. They pay $50,000,000 a year rental. They represent an actual investment of $100,000,000 at least, capitalized at twice that sum, and paying about $10,000,000 a year profit. That invention of mine was a very good thing for the girls, which is a gratifying thought. It employs 20,000 people, mostly young women. I got for the telephone about $102,000 in all. Taking out what I expended in experiments I probably realized $25,000 in clear profit. Bell made about half a million. Many people imagine that he made an enormous fortune, but he didn't. It was his father-in-law who made a vast fortune by getting control of much stock.

"My electric pen and mimeograph duplicating apparatus is used very largely here and in Europe. Three hundred men make a living out of it. The profits on that are not large.

"My incandescent light system is the most satisfactory to contemplate as regards the employment it gives to great numbers of men. Throughout the world 36,000 men making a living out of that invention. In my shops at Schenectady I employ 3,800 hands; at my Harrison lamp works, 1,000; in the New York works, 150. About four million lights are burning. These represent an investment of cold cash of a hundred millions. I can count up eighty-seven millions. In addition to that customers have paid twelve millions more for the installation of wires. The thing is capitalized, taking all of the companies together, at about two hundred millions, paying from 4 to 20 per cent a year. My patents on incandescent lights netted me about $140,000. I spent about $400,000 in experimenting.

"The electric railway is, of course, not such a big enterprise. I built the first in the United States at Menlo Park in 1879. It was three miles long, and on it I obtained a speed of forty miles an hour. I sold it out long ago. I did not get my money back on it.

"The phonograph is a new thing. It will take four or five years to pioneer it. It will be greater than the telephone. To pioneer a thing is to get it on its feet. It took twelve years to pioneer the typewriter. Yes, I might invent an electric typewriter, a noiseless one, but the thing is not pressing, as it is in very good condition now. I have sold the phonograph out, but about that there is a complicated story, which need not be told. I have made no money out of it, but there is one thing which I am now working on out of which I shall make money, and of which nobody can get any share except the boys here who own the thing with me. That is the magnetic concentration of iron ore. It is the latest commercial thing I have got up. I have a mill at Ogden, N. J., with a capacity of 2,000 tons in twenty hours. This is the idea briefly. Iron ore is not Bessemer ore unless it contains as little as a fifty thousandth part of one per cent of phosphorus. If it has more phosphorus than that, it is brittle and cannot be used for making Bessemer steel. We are obliged for our Eastern manufacturing interests to import Bessemer ore from Algiers, Cuba, Spain, etc., as the freight from Michigan is too expensive. We import about 1,600,000 tons per year. New Jersey contains the largest strip or area of primal rock containing ore in the United States. There is probably more ore in this State in the primal rock than in all the rest of the States put together. The magnetic concentration of that ore would produce enough to supply the United States for centuries. The process of concentration—that is, of extracting magnetically the small particles of ore from the rock in which it is scattered—makes it Bessemer ore of the highest quality by destroying the phosphorus in it. I have been for three years leasing all the available deposits of ore in New Jersey. I have secured eighteen square miles of mineralized rock now. This will be for me a regular Standard Oil enterprise. In six or eight years I shall take out ten or twelve million dollars' worth of ore a year, at a profit of about three millions a year clear. I have now in contemplation eight mills.

"From my various patents, so far as the patents themselves go, I have stood an actual loss in experimenting and in lawsuits of $600,000. I should be better off if I had not taken out any patents. I do not mean to say that I am a pauper, as you might think from my talk. But my money has not been made out of patents, or out of any protection that the Patent Office has given me. I have made it all out of manufacturing, and I have made quite enough to pay for my experiments and to get a good living, which is all that I care about."

"Mr. Edison, Chauncey Depew in his speech at the World's Fair dinner commented on the fact that whereas in the exposition in Philadelphia there were only a few overhead wires to tell the tale of electrical inventions, the Chicago exposition will contain a building of great size, devoted exclusively to the progress of electricity, and filled with machines, nearly all of them the work of one man. If you were to try, regardless of space, how big an exposition of your own work do you think you could get up? How many machines have you worked on in your life?"

"Well, it would be hard to say. I have worked on as many as forty machines at one time. An exhibition of all the machines that I have worked at and experimented on, if I had kept them, would cover about twenty-five acres."

Silver.

If silver keeps on the down grade in price, some more of the big mines of Butte, Montana, will have to cease operations. The Clear Grit and Black Rock closed recently. The Granite Mountain, of Montana, and the Ontario, of Utah, are two of the great silver mines of the country which can keep on some time longer, but few others can.

The outlook for silver at this session of Congress does not appear to be very good, and its friends are not so hopeful as before the session commenced.

The gradual drop in the price of silver is very discouraging to the miners in the silver camps. As there are more silver mining camps than gold, this greatly affects the mining industry. In some of the big camps work is bound to give out for the men unless there is a change for the better shortly. Not only must those mines now opened curtail operations, but new ones will not be developed until the prospects are better than at present. Ores of gold, copper, and lead will be more in demand for awhile until the silver question is settled. It is most unfortunate that it should have got into politics.—*Min. and Sci. Press.*

SODA-SALTPETER, $NaNO_3$, is found in extensive deposits of thicknesses ranging from 0·3 to 1·5 m., and 30 miles long, in the middle part of the rainless west coast of South America, principally in the south of Peru and north of Chile. According to these principal mining places it is in commerce called Chile or Peruvian saltpeter. The saline masses there deposited consist in pure, dry, and hard saltpeter, lying almost bare and immediately under the surface. It is supposed that the beds have been formed of rotting seaweeds in presence of sea salt.

The Decomposition of Water.

Lord Rayleigh, delivering a lecture at the Royal Institution on the decomposition of water, recently, explained the latest methods of doing so by experiments. He said, in order to form water, it was necessary to take two volumes of oxygen to one of hydrogen. From that point of view the constitution of water was perfectly well known. But there was also the question of the relative weights of the two bodies, and how far the ratio of two to one really represented in the matter of volume the facts of the case. If the ratio in volumes were always the same, the question of weight would be the same as that of the relative densities of the two gases. In round numbers the weight of oxygen was sixteen times that of hydrogen. According to Prout's law, these ratios were always represented by some exact multiple. Thus, if hydrogen was taken as the unit, oxygen would be 16 and carbon 12. The question of atomic weights and relative densities was primarily experimental, but there was great danger of twisting *data* so as to meet the requirements of a preconceived idea. The investigations of chemists with respect to hydrogen and oxygen had varied, but not within great limits. In 1842, Dumas thought that the weight of oxygen was 15·96 times that of hydrogen, and Regnault, in 1845, came to the same conclusion. It was, of course, not improbable that this slight deflection from the exact number 16 arose from error of calculation. For a long time this question slumbered, and it was not for forty years that attention was again directed to it. He had himself, in 1888, arrived at the conclusion that the right proportion was 15·884 to one; and other chemists, both in Europe and America, had published the results of their inquiry, which all gave figures between 15·7 and 15·9. The real difficulty arose from the extraordinary lightness of hydrogen, which was only $\frac{1}{14}$ as heavy as the air. The glass in which the weighing was done might be 200 grammes, while the hydrogen contained therein was only $\frac{1}{10}$ of a gramme. Our brass and platinum weights were accurate enough to record infinitesimal weights; but that was not the crux. The atmospheric conditions might cause a greater disturbance than the weight of the hydrogen. To meet this difficulty Regnault had devised a method of weighing two glass vessels as similar to each other as possible against each other, so that each would be affected in like manner by any sudden change of external conditions. The effect of moisture or changes of barometric or thermometric conditions might be very different as between platinum weights and glass; but with two glass vessels constructed precisely alike the difficulty was eliminated. Lord Rayleigh then explained and illustrated the decomposition of water and the desiccation of the hydrogen so as to make it absolutely free both from oxygen and moisture, which was effected by means of passing it through phosphoric anhydride.

The Invention of the Submarine Armor.

In an article on the history of the mechanical arts published in *La Nature* of December 5, 1891 (reproduced in SCIENTIFIC AMERICAN SUPPLEMENT, No. 837, page 13368), one of the most striking figures, says Mr. Berthelot, of the Institute of France, is the one relative to the submarine armor, and which shows that this existed as far back as the beginning of the fifteenth century. "Having since found various new data upon this subject," says Mr. Berthelot, "it seems well to me to reproduce them briefly."

The idea of supplying air to divers submerged in water is very ancient. In the Problems attributed to Aristotle (section xxxii., § 5), we read the following passage:

"When an inverted vessel is let down to divers, it facilitates their respiration. The vessel does not fill with water, but retains the air. Moreover, it is only through force that it is made to descend in the water, for the vessel is kept perfectly upright, and, however slightly it be inclined, the water rushes into it."

Many attempts must have been made in the course of time to supply air to divers, although no trace of them has been pointed out up to the present. The apparatus figured in the memoir of Munich is the most ancient one known, but the tradition of the submarine armor starting from the fifteenth century is attested in an uninterrupted manner by authentic documents. In certain editions of Vegetius, such as those of 1532 and 1553 (both of Paris), we see, on pages 106-107, 176-177, and 180-181, figures of armored and ordinary divers, like those of the MSS. presently to be mentioned, and of which they appear to be the prototypes. In consequence of a singular error, some persons have attributed these figures to Vegetius himself, who says not a word about them. They are really the work of the editors of the sixteenth century, as the aspect alone of the persons shows at a glance. Mr. Berthelot has found similar figures in the French MS. No. 14,727 of the National Library, written in the first half of the seventeenth century, and which was the note book of a French engineer. On the recto of the fifth, last but one folio, we see a diver with his costume and his air tube alongside of a large reservoir designed to supply him with the air necessary for his respiration. On the verso there is another figure of a diver entirely analogous to that of the Munich MS.; and, alongside, a man provided with a sort of swimming belt. On the folio following, there is a naked man under water breathing the air contained in a bladder, or rather a leathern bottle. This represents a much more primitive type, and one analogous to that of the Problems of Aristotle. The armor of the diver was partly of leather and capable of being inflated, so as to perform the role of swimming belts, as appears from the figures found near the middle of MS. No. 14,727, and which are like those of the Munich MS., but accompanied with an explanatory legend: "Various kinds of leather belts, which are to be inflated with air in order to cross a river." Beneath, there is an inflated leather bottle designed to be affixed thereto.—*La Nature.*

CHARLES J. VAN DEPOELE.

This eminent electrician and inventor died at his home, Lynn, Mass., March 18. For the accompanying portrait, reproduced from the last photograph for which Mr. Van Depoele sat, and for the following details we are indebted to the *Electrical Review.*

The deceased was born in Lichtewelde, Belgium, April 27, 1846. When but a boy the first telegraph line was put through near his birthplace, and from watching the operations he became much interested. With what little money he could get by running errands and doing odd jobs for the neighbors he bought himself a couple of battery cells and some instruments, and from that time was constantly experimenting. At one time he had a battery of over 100 cells, which, owing to the opposition of his father, who looked upon electricity as nonsense, he was compelled to hide in a loft in the house in which he lived, and there, on his father moving to another place, they were left. He continued his experiments, spending every spare moment he had in that way, and every cent that he could get went to buy apparatus.

CHARLES J. VAN DEPOELE.

When about 15 or 16 years of age his father apprenticed him to a church furniture and fancy wood carver in Paris, where he soon became master of the trade, devoting his evenings and oftentimes sitting up until daylight experimenting. He continued in this business until, in 1871, he came to this country and settled in Detroit, Mich., where he started a shop of his own, being at the head of 200 hands at one time.

His father, who had followed him here, and his many friends objected to his persistent experimenting and wasting of money, as they were pleased to call it, and met to have him sign papers agreeing to give up his experiments altogether. The meeting had just an opposite effect, and young Van Depoele swore that from that time on he would devote the whole of his time and money to the study of electricity. Accordingly, he placed his father at the head of his shop and, building a little place of his own near his residence, worked altogether at developing his ideas. Becoming interested in the electric light about that time, he constructed a dynamo, and in 1880, after moving to Chicago, formed the Van Depoele Electric Light Company, with A. K. Stiles at its head. The following summer he lighted some of the streets in Chicago gratis, and soon the company made and carried out numerous contracts.

As soon as this company was fairly started he began advocating the idea of running railways by electricity, contrary to Mr. Stiles' wishes, who thought nothing would come of it. Van Depoele was undaunted, and in 1883 he obtained Mr. Stiles' consent to put up a short exhibition railway in Chicago. Seeing the success of this, Mr. Stiles became enthusiastic, and from that time on offered no opposition.

In 1884 he constructed a conduit road at the Toronto (Ont.) Exposition, followed in 1885 by the overhead system in the same place.

During the next three years he was busy developing the electric railway, taking out many patents and building several railways in Toronto, Ont., South Bend, Ind., Minneapolis, Minn., and other places. In 1888 the Thomson-Houston Company, of Lynn, observing the success of his railway, bought out all of his railway patents, and in March of that year he came on to Lynn and was connected with the company ever since as electrician and inventor.

It was also by his untiring efforts that the electric percussion drill was brought to its present state of perfection, he having begun his experiments in that field as far back as 1882. Thinking that electricity could be used in the exploitation of mines, he talked with Mr. Stiles about the matter. Mr. Stiles immediately offered him money to carry on experiments, and he soon evolved a drill. Two were manufactured by the Thorn Wire Hedge Company, of Chicago, and experimented with in the company's shops. They were powerful enough to knock to pieces some very large stones on which they were used. Much encouraged, he continued his work, taking out numbers of patents and developing and improving the machines, until now the result of his exertions is seen in the mining drills, pumps, hoists, etc., of the Thomson-Van Depoele Electric Mining Company, whose patents were lately bought out by the Thomson-Houston Electric Company. Though much interested in all branches of electricity, it is the electric railway and electrical reciprocating devices that owe most to him. At the time of his death he was developing and improving his apparatus in the latter field.

Impeding Patent Office Business.

The many ways in which the business of the Patent Office is being constantly retarded by the insufficient appropriations of the government for the proper maintenance of the work of this bureau has been a matter of frequent comment for several years. With the growth of the business of the office there has been no adequate preparation for its natural expansion, and the Commissioner has just been obliged to issue a brief official notice to the effect that "in consequence of want of room for the proper storage and arrangement of printed copies of patents, it will be impossible to fill orders in current issues until additional room is provided by the proper authorities."

Those who are now obtaining patents from week to week are likely, therefore, to have some trouble in obtaining duplicate copies of any patents issued after March 8, and may in some instances be subjected to annoying delays, although copies of issues of an earlier date are obtainable as usual. Congress has failed from year to year to provide room for this rapidly growing, money earning institution. Its examiners and clerks are packed into rooms so small they can hardly breathe, and its immense mass of valuable records are stacked up on triple rows of pine shelves in the corridors, where moth and dust may easily corrupt and where a fire may break out if thieves do not break in. Now even this space is exhausted, and copies of patents now being issued cannot be stored, so that copies can only be obtained with difficulty and delay. It is certainly high time that some measure of effective relief was provided.

To Make Wax Sheets.

I have used the following plan for the last fifteen years: After the wax is properly cleaned, get four pieces of glass cut the width you want to have your sheets and about ten inches long. Any deep vessel, such as a dinner pail or an old oyster can, will serve to melt the wax. Put the pieces of glass in a pail of cold water; when the wax is melted, take two pieces of the glass, one in each hand, and dip alternately, one cooling while you dip the other (about three or four dips is sufficient), then drop into the cold water. Let these two remain till you dip the other two in the same manner. By trimming the edges off the glass with a knife, the sheets will drop off themselves. If the wax is kept too hot, the sheets will be too thin; if too cold, they will be lumpy and thick. Near the setting or cooling point is the proper temperature. A tablespoonful of Venice turpentine to three or four pounds of wax will toughen it. This should be evaporated to dryness like resin. It can sometimes be obtained in drug stores in this form. It will answer the purpose even if used thin, but the thicker it is the tougher will be the wax sheets.—*Dr. Beacock, Dom. Dent. Jour.*

Double Carbon Lamps.

On March 1 the Brush Electric Light Company scored an important victory in court. In its suit against the United States Electric Lighting Company, asking for an injunction restraining the latter company from using the double carbon lamp, which was patented by Charles Brush, September 2, 1879, the court granted a perpetual injunction, and ordered that testimony be taken of the amount due the Brush Company for infringement of the patent.