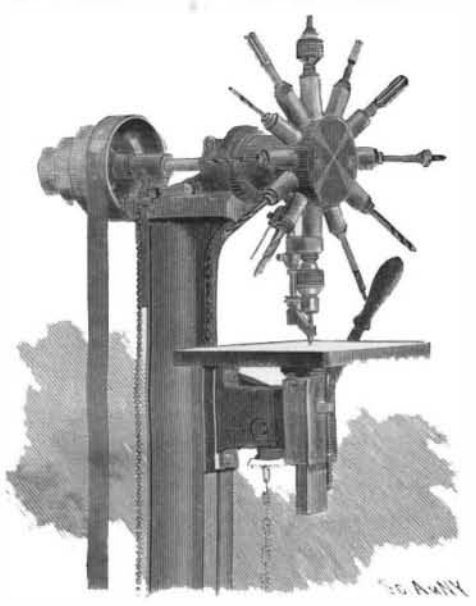
QUINT'S TURRET DRILL.

The illustration shows a twelve spindle turret drill in which the principle of construction is the same as the well known turret lathe, with the exception that the turret drill works in a vertical position in place of the horizontal. One other important difference is that the cutting tools revolve in place of the work, as is the case with all turret lathes; this allows the finishing of a hole in large or irregular work without moving same, thus assuring accuracy. The spindles are driven from inside turret by bevel gears. Only the spindle in a vertical position revolves, all others are stationary. Any spindle may be thrown into or out of position while machine is running.

The turret drills have the following advantages: Small space occupied for the number of spindles. All

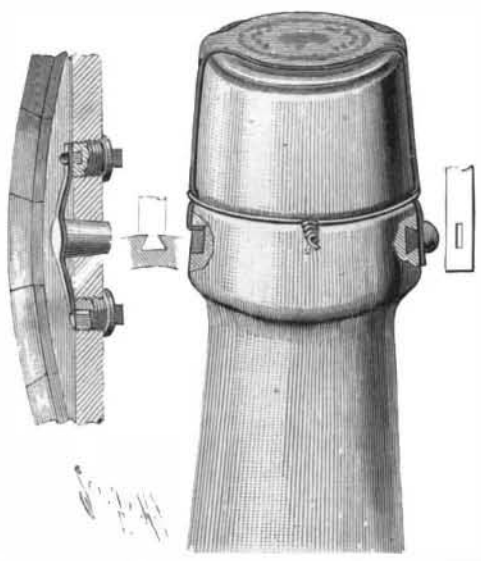


QUINT'S TURRET DRILL.

tools working to same point in center of table. The saving of operator's time in changing tools and moving work. Drilling and tapping at same operation. Small wear of spindles and bearings, as they revolve only when in position for work. The turret drills are built with from two to twelve spindles, as desired, and are specially adapted for drilling, reaming, tapping and hub milling, bicycle, electrical or any light or medium sized machine work. This admirable device is manufactured by A. D. Quint, Hartford, Conn.

SEAL FOR VESSELS CONTAINING LIQUIDS.

The sealing device for the corks of bottles or the bungs of casks shown in the engraving has been patented by Mr. Nicholas C. Patterson, of Junction City, Texas. On opposite sides of the neck of a bottle notches are formed, the opposite walls of the notches being undercut to form locking shoulders for the seal, which consists of a metal strip, of sufficient length to



PATTERSON'S SEAL FOR VESSELS CONTAINING LIQUIDS.

extend over the cork from one notch to the other. One end of the strip is dovetailed so as to securely engage the notch, and the opposite end is perforated with a narrow, longitudinal slot. After the bottle is filled and the cork inserted, the dovetailed end of the strip is inserted in its notch, and the strip is bent down over the cork until the perforation in the other end is opposite the other notch. Molten glass is then run through the perforation and into the notch, and a small bulb is formed on the outside of the strip. When the glass seal is hardened it will be firmly keyed in the notch, and the bulb only connected with the bottle by a narrow neck, where it passes through the perforation. It is evident that this neck will easily break should any attempt be made to slip the strip laterally off the cork, and the fraud would be at once detected. When it is desired to remove the seal and strip, a slight tap on the bulb will break the seal and loosen the strip. To hold the ends of the strip in position while sealing, a groove is formed on the neck of the bottle and a small wire is wrapped around it.

When the device is applied to the bung of a barrel, glass sockets, with undercut walls, are used. These are screwed into the head of the cask from the inside, and are prevented from being pulled through by flanges which bear against the inner surface of the head. The sealing strip is similar to that above described, and is similarly secured. From the description it will be seen that the same bottle or cask cannot be filled twice, as any attempt to pick out the old plug would break a hole through the neck of the bottle.

Nervous Strain of Railway Work.

"There is reason to believe," says the British Medical Journal, "that at all times there are men on the line who are working very near to their breaking strain. We may in regard to this mention three well known instances which, at the least, show the tension under which work is often carried on. A station master, seeing a man run over on the line, himself fell down dead upon the platform. Here was a shock which permanently made his heart stand still; but how many times had not that man's heart stood still before? We may feel perfectly certain that if the major shock could kill, the minor daily recurring shocks of a railway life must have greatly damaged a heart so under the influence of the nervous system. Two trains collided at a function. It was either the fault of the drivers or of the rails, certainly not of the signal man. The signals were right; yet when the box was entered the signal man was found to have gone mad, and had to be taken to an asylum, where he remained for long. He was broken utterly by the horror of the dilemma; but what shall we say about the smaller dilemmas which every hour of his working life he had had to solve? Did they not also have an effect, although a lesser one, upon his brain? A few years ago it was found that the sickness rate among the signal men of certain lines was becoming excessive, and it was determined to do away with the system of leaving to one man the whole responsibility of taking charge of a signal box. At great expense every box along the line was supplied with two men. Great evils were prophesied; it was thought the men would talk, and lark, and neglect their duties. This did not happen, but the sickness stopped. Under the shared responsibility they no longer broke down. If then, as seems to be indubitable, railway 'strain' can have definitely injurious effects upon the nervous system, it becomes an important question for inquiry whether this nervous derangement at all frequently has the effect of impairing the nutrition of the heart. Upon this special point we do not at present possess sufficient information to warrant the expression of a definite opinion."

Reasons for the Siberian Railway.

Siberia is a Russian Canada, larger and more populous, and, like Canada, it has a great future before it, says the Fortnightly Review. It is very rich in gold, while there are whole hills of graphite (black lead) and lapis lazuli; coal can be picked up on the very road near Nerchinsk, there is silver in the same district, and there are rich mines of iron near Nikolaefsk. Siberia, like Canada, is rich in fish. On the Amur River I was told that 200,000 pnds of the kita fish have been caught within a few weeks in August, when the fish ascend the rivers; the pud (pood) being 40 pounds, that means 8,000,000 pounds of fish. In the Khabarofka Museum is a stuffed kaluga fish weighing 30 puds, or 1,200 pounds, caught in the Amur. The Russians have been struck by the fact that "the prosperity of Canada and its productive activity have grown, and continue to grow, with a rapidity which appears to us (Russians) miraculous, and by us inimitable, just from the date of the completion of the Canadian Pacific Railway from the Pacific to the Atlantic Ocean."

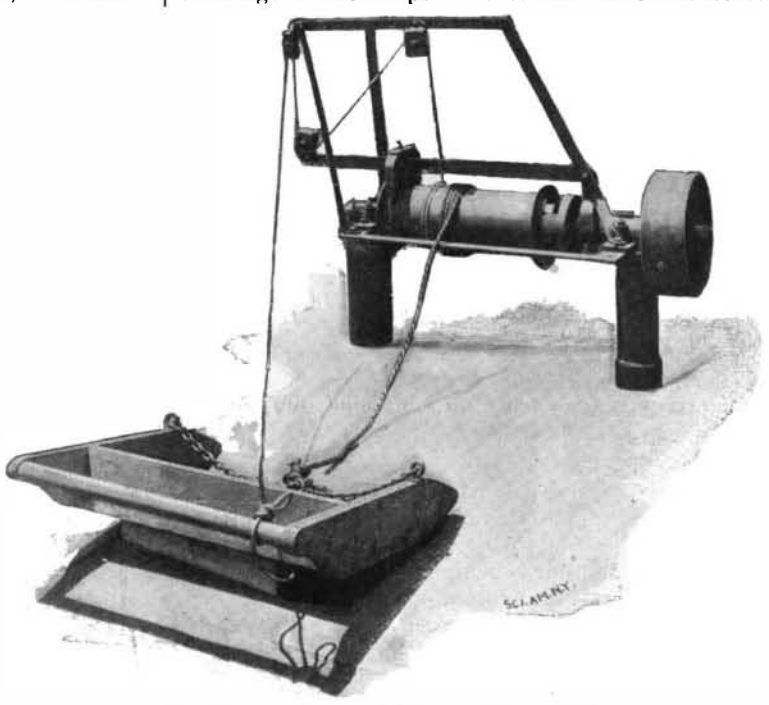
In 1889 they deputed two engineers to observe the Canadian line and its conditions and results. Attention in Russia was drawn to the facts that Canada, a country then of 4,000,000 people, had, by its own resources, without any pecuniary help from outside, connected the two oceans by an iron road 4,500 versts (3,000 miles) long, over very difficult and expensive ground for building, in the short time of four years; that the energetic population of Canada, 3,600,000 in 1871, and only increased to 4,300,000 in 1881, reached 5,000,000 a year or two after the first through train passed Winnipeg in 1886; that the quantity of grain carried in Canada had increased from 303,571 tons in 1886 to 500,000 tons in 1888; that in places without population there had arisen seven new towns, such as Vancouver, founded only in 1886, and holding 9,000 inhabitants in 1891. It was made known to Russia that "the cost of the Siberian Railway should not be even 65 per cent of the cost of the Canadian Pacific."

Coffee as a Disinfectant.

"A year ago, a Russian bacteriologist made some experiments for the purpose of determining the influence of coffee in destroying disease germs," says Modern Medicine. "The conclusion was that coffee is to some degree a disinfectant. The disinfectant properties of coffee depend, however, not upon the active principle of coffee, or caffein, which it contains, but upon the substances developed in the roasting of the coffee. It was found that the various substitutes for coffee are also germicides, and, like it, develop disinfectant properties during the roasting process. A watery infusion of either coffee or its substitutes was found to be capable of killing the germs of cholera within a few hours, and of typhoid fever in a somewhat longer time. The conclusion should not, however, be drawn from these statements that either coffee or its substitutes are to be considered of value on account of their slight antiseptic properties, as too long a time is required for the destruction of germs by them."

GRAIN SHOVEL FOR UNLOADING CARS.

The accompanying illustration shows the general features of a device for saving time and labor in unloading grain cars, or in shifting grain within a warehouse, for which a patent has been granted to Mr. Edwin C. Harnden, of Carbondale, Pa. To the bale of the scoop or shovel is secured a pulling rope, which is arranged to wind upon a loose drum which revolves



GRAIN SHOVEL FOR UNLOADING CARS.

upon a shaft suitably journaled in a convenient position within the warehouse. The shaft is driven by means of a pulley and belting from the machinery of the warehouse and it is provided with a shifting clutch which is controlled by a spring which holds it in its normal position clear of the drum.

The clutch is operated by a shifting lever, which is pivoted on a wrought iron frame, carried above the journals, to which said frame is bolted. At the end of the long horizontal arm of the lever is a pulley, and two more pulleys are provided above the arm on the top bar of the frame. A controlling rope is attached to the drum, and after passing over the pulleys, as shown in the engraving, it is carried to the handle bar of the shovel. In operation the shovel is drawn back to the desired position on the grain heap, and on pulling the controlling cord the lever arm is raised, thereby throwing the clutch, which is keyed loosely upon the shaft, into gear with the drum. This winds up the rope, which is attached to the bale of the scoop, and drags it forward to the edge of the car, or to the desired position on the warehouse floor.

A Demand for Better Motors.

The Metropolitan Traction Company of this city have been experimenting with the underground trolley to take the place of the cable, which is now employed. President Vreeland has this to say regarding the result:

"We are willing to try any motor that promises to be of any value or to change to any form of propulsion that will give better results than the cable. Probably the most satisfactory motor at present is the overhead trolley, but we are not permitted to use that. We have tried experiments with the underground trolley, but find that it is in many ways unsatisfactory. Just as soon as anybody has a practical compressed air motor—or any other kind for that matter—we want him to bring it to us. But we can't be expected to rush into every hare-brained scheme."

Science Notes.

It is said that the petrified remains of a whale 80 feet in length have been found in the hills north of Lompoc, a few miles back from the sea in Santa Barbara County, California.

Essential oil of garlic has been used to cure consumption by D. Sejournet, of Revin, in the Ardennes. Mixed with two hundred times its weight of sterilized olive oil it was injected under the skin, producing a marked improvement in the sixteen patients on whom it was tried.

A five pound meteorite which fell last April in an orchard near Namur, in Belgium, nearly killing a young man who was digging there, has been examined at the university laboratory at Ghent. It consists of a whitish crystalline paste, containing iron, troilite, olivine, bronzite, etc.

A method of mummifying the dead by absorption of humidity and gases after the body is placed in the coffin has been devised by an Italian named Vercelloni. The body seems to be preserved as if in life, except that the color is the yellowish copper tint peculiar to Egyptian mummies.

Dr. P. L. Phipson has found in some Norwegian granite nearly two per cent of mixed oxides of the rare metals; cerium, yttrium, lanthanum, thorium, zirconium, and didymium were discovered. It is very probable that this discovery will be of commercial importance to the incandescent gas light industry.

It has been pointed out that the moist leather of street car straps is a peculiarly fertile medium for the conveyance and propagation of infectious diseases. It has been suggested that as a sanitary measure the straps should be furnished with handles of brass, which should be washed with a disinfecting solution every day. In this manner some of the danger would be abrogated.

Dr. J. Forster, of Amsterdam, has prepared the following table as the result of a large number of experiments on the time and temperature required to destroy the micro-organisms of milk:

131° F. for 4 hours.	176° F. for 5 minutes.
140° F. for 1 hour.	194° F. for 2 minutes.
149° F. for 15 minutes.	203° F. for 1 minute.
158° F. for 10 minutes.	

The survey of the volcano Popocatepetl, for the purpose of determining the best location for an aerial cable railway to the summit, has just been completed, says The Engineer. It has been determined to start the line from the ranch of Tlamacus, and it will be connected with the Interoceanic Railroad at the base, so that the business of shipping sulphur can be cheaply accomplished. This new railway will be a great attraction to tourists, who will now be able to make the ascent to the summit, 18,000 feet above the sea, and also descend to the crater, where the process of extracting sulphur is being carried on.

Dr. Robert Hutchinson, referring in the British Medical Journal to the recent claims by Baumann, Fraenkel, and Drechsel, that they have discovered the active ingredient of the thyroid gland, states that he has found the activity to reside in the proteids of the gland. These proteids are practically only two in number, a nucleo-albumen and the colloid matter, and the latter is the only one that is active. It has been isolated in a state of purity, and is described as containing a considerable quantity of iodine in organic combination. Dr. Hutchinson has succeeded in splitting off from it a body apparently identical with that obtained by Baumann from the entire gland.

Directions for preparing barium platinocyanid, the original fluorescent substance used in Salvioni's skiascope and similar devices for directly viewing Roentgen shadow pictures, are thus given in the National Druggist: "It can be obtained, no doubt, of any chemical works, on application, but as to its cost we have no information. It can be prepared very easily by proceeding as follows: Add three parts of barium carbonate, in finest subdivision, and two parts of platinum chlorid, to ten parts of distilled water. Put on a water bath and heat. When the boiling point is nearly reached add hydrocyanic acid, a little at a time, until the cessation of bubbles shows that carbonic acid and oxygen are no longer given off. The resulting barium platinocyanid, after crystallization, answers to the following formula: $Pt(CN)_4Ba + {}_4H_2O$."

M. Raoul Pictet, in some recent experiments, says the Progressive Age, has shown that bodies such as the sulphides of calcium, strontium, lithium and barium cease to phosphoresce at low temperatures. The substance experimented on was reduced to fine powder and placed in a tube. This tube was exposed to the rays of the sun and then carried into a dark room and plunged into a glass vessel containing liquid nitrous oxide at a temperature of —130° to —140° C. No signs of phosphorescence were visible. The same was the case when the tube was plunged in alcohol at —100° C. On lowering the tube down slowly into the cold liquid, the phosphorescence was seen to fade away. M. Pictet has also exposed the tubes to magnesium light when very cold. No signs of phosphorescence made their appearance until the tube had heated up again, when it became visible.

Remarkable Heat Record in Australia.

Some remarkable facts in regard to the heat record of January last in Australia have recently been published in the New York Tribune:

An accurate record of Farenheit readings observed in the shade on a veranda overlooking the Darling River, in New South Wales, in January last, is as follows: On New Year's Day, 112°; on January 2, 107; thence steadily rising to 123 on January 7; falling to 114 on the 10th, only to rise to 124 on the 11th; and then, with some fluctuations as low as 117, but not lower, scoring 128 on the 15th and 16th, and 129 on the 18th. Such temperatures in the shade seem incredible. But the record is true. From January 1 to January 19 the range of heat was from 107—the lowest—to 129° in the shade. What it was in the sun one hesitates to think. At Adelaide on January 23 the mercury registered in the sun the appalling height of 172°. Nor was there any appreciable relief from the heat at night. For the first three weeks of January at no time in the twenty-four hours did the mercury fall below 100, and in many places 105 was the lowest point recorded.

This "spell of weather" was exceptional, no doubt. Just what caused it is one of the mysteries of nature thus far inscrutable to mortal ken. Theories are plentiful as blackberries, but none of them convincing. Perhaps the most significant scientific fact connected with the case is that in the Southern Hemisphere summer occurs when the earth is nearest to, and winter when it is furthest from, the sun; exactly the reverse of the conditions prevailing in the Northern Hemisphere. We may naturally expect, therefore, to find the extremes of heat and cold more marked there than here, and such is indeed the case. Let us compare, for example, Grafton, in New South Wales, near the coast, with New Orleans. They are about equidistant from the equator, Grafton being in 26° 43' south and New Orleans in 30° north latitude. The mean temperature of the former is a little cooler than that of the latter—68·5° and 69·8° respectively. The mean summer temperature of Grafton is the cooler—77·1° against 82°—and the mean winter warmer—58·1° against 55·8°. From these figures one would say Grafton has a more temperate climate than New Orleans. But the record of extremes makes a different showing; for the highest reading of the thermometer at Grafton is 118° in the shade, while at New Orleans it is only 94°, and the lowest at Grafton is 20·9° against 31° at New Orleans. The conclusion is, therefore, that while on the average the Southern Hemisphere is fully as temperate as the Northern, and perhaps even more so, it is subject occasionally to far greater extremes of heat and cold.

But whatever the cause of this hot wave of last January, the results of it are scarcely to be described. People died by thousands. Birds dropped dead from the trees. Rabbits and other animals, though hidden in the shadiest recesses of the forests, perished wholesale. Those that survived were dazed and stupefied, so that the wildest and shyest could be anywhere approached and picked up. Even insect life succumbed, and perhaps the most impressive record of all was that furnished from a place called Nyngan, to the effect that "mosquitoes are being killed by the heat." And all this, it must be remembered, was in a so-called temperate zone, in latitude 30° to 35° south, corresponding in situation with South Carolina and Georgia! Surely, in the face of such a record, with the mercury in the nineties we may keep cool and take courage.

Treatment of Smallpox by Exclusion of the Chemical Rays of Daylight.

In September of last year Dr. J. Moir drew attention in our columns to this treatment of smallpox, and we have since received communications on the subject from Dr. Moir, Dr. Finsen, and Dr. Feilberg. Dr. Finsen has recently published an interesting historical account of the red light treatment of smallpox, the scientific basis on which it is founded, and the method of carrying it out. Dr. Feilberg states that he was at first very skeptical as to the influence of red light on smallpox patients, but, nevertheless, tried its effect on several unvaccinated children suffering from smallpox, and was surprised at the favorable course which the disease took. The vesicles did not suppurate, there was no secondary fever, and no permanent pitting resulted. The essential point for the success of this treatment, according to Dr. Feilberg, is that the patients should come under treatment during the early stage of the disease, shortly after the vesicles have appeared. If the seventh day has been reached, suppuration can hardly be avoided. Another important point is that the exclusion of the chemical rays of daylight must be complete and continued until the vesicles have quite dried up. Dr. Moir, while admitting that Dr. Finsen bases his treatment on a scientific basis, and notwithstanding the extreme ability displayed both by him and Dr. Feilberg and the care and fairness shown by them in their papers, is still doubtful as to whether their explanations are correct. He admits that he criticises without experiment, but, though he has not used identical treatment, yet he has given trial to somewhat similar experiments. For instance, he used to employ a solution of collodion and castor oil on the exposed parts to prevent suppuration and pitting, also, for similar reasons, iodine and glycerine solution, the latter particularly apparently meeting Dr. Finsen's chief requirements; but, as the result of these and similar trials, he still believes that the only distinction to be depended on as to the extent of suppuration and pitting is the presence and quality of the successful vaccination.—Lancet.

Electricity Direct from Coal.

Two processes have recently been described by which electricity can be produced direct from combustion of coal, says the Engineering and Mining Journal. One process is that of Dr. W. W. Jacques, of New England, and his process may be briefly stated as consisting in blowing air though a bath of fused caustic soda, having a carbon anode and iron cathode, whereby he obtains a "very large" current, but the voltage "is low." So many details are missing in the published descriptions that it is hardly possible to attempt a discussion of the merits of the discovery.

Another worker in something the same line is Dr. Alfred Coehn, of Germany, who takes as a basis for his work the principle that a method of obtaining electrical energy direct from the oxidation of carbon may reasonably be sought, first, by determining the conditions under which carbon can be attacked in an electrolyte by the aid of an external circuit, and thereby adapting these conditions for the production of a current. His paper is given on the following page.

The Japanese a Quarter of a Century Ago.

"Thirty years ago," says Chauncey Depew, "I was appointed United States minister to Japan. That country had just been opened to the commerce of the world. Its government was a pure feudalism and of the type of the period of Louis XI. The feudal lords had their armies and their castles and the tillers of the soil were little better than slaves. To-day Japan is governed by a constitutional monarchy and a congress of the representatives of the people. It has an enlightened press, railroads, trolley cars, and electric lights. Then its army fought with spears and bows and arrows, and its soldiers were clad in armor. To-day it has the most efficient navies and best trained and most effective armies in the world. It has utilized every advantage in modern warfare, and in its attack upon China demonstrated that upon land and sea the army and navy of Japan are equal to those of the most advanced of the warlike nations of Europe. Japan is a superb illustration of this age of electricity. It took six hundred years for Europe to progress from feudalism to constitutional liberties and parliamentary government, and from armor and lance to the torpedo and the machine gun. Japan has accomplished the same progress in a little over a quarter of a century."

A Novelty in Magnesium Light.

Magnesium for flash or "torch" has been very popular for some time past, but ribbon or wire is very liable to "give out" just when the light is most needed, except when special precautions are taken or arrangements made. But the new method of burning seems to offer a perfect medium of actinic combustion. It consists in the "sandwiching" of magnesium powder between sheets of paper impregnated with potassium chlorate. Magnesium powder is placed between two sheets of paper, which have been pasted over with starch. The whole, when dry, forms one single sheet. Next, each side is covered with a piece of paper impregnated with potassium chlorate, and the whole covered with a further sheet of paper pasted on each side, a thick sheet, almost like cardboard, being thus produced. It may then, when perfectly dry, be cut into lengths and ignited as required. According to the Journal of Chemical Industry, the combination is quite safe and keeps well.—British Journal of Photography.

THE Swiss government has instituted a collective investigation of diphtheria on a national scale, which is to be continued for two years from March 1, 1896 (Med. Rec.) Every case of the disease, whether under the care of a private practitioner or in a hospital, is to be notified to the local sanitary authority, and every week a report is to be sent to the Swiss health office at Berne. Forms for this purpose with addressed wrappers are supplied to each practitioner. In order to insure completeness, and as a measure of justice to the physician, a small fee will be paid by the authorities for each form duly filled and dispatched.

M. MOISSAN is reported to have discovered a substance which is harder than the diamond, in the form of a compound of carbon and boron. It is produced by heating boracic acid and carbon in an electric furnace at a temperature of 5,000°. In appearance the composition is black and looks not unlike graphite.

Notice to Our Readers.

In order to obtain the opinion of the readers of the SCIENTIFIC AMERICAN as to what invention *introduced within the last fifty years* has conferred the greatest benefit upon mankind, we publish the accompanying card, which please cut out and return to the editor. Those who preserve the paper for binding and do not desire to deface their files, or who read this notice at a library, will please answer by postal card. It is desired to get as full a vote as possible. The result of the vote will be published in the *Special 50th Anniversary Number of the* SCIENTIFIC AMERICAN *on July 25.*

Editor of the SCIENTIFIC AMERICAN.
Dear Sir:
I consider that.....
.....
invented by.....
has conferred the greatest benefit upon mankind.
Name.....
Address .....

The Phonendoscope.

This invention, says the English Mechanic, is stated to be due to Profs. Bazzi and Bianchi, and is said to be useful for hearing: 1. The sound of the respiratory organs, of the circulation of the blood, and of the digestive organs in the healthy body as well as in the sick subject. 2. The sounds made by the muscles, joints, and bones. 3. The sounds in the matrix at the time of pregnancy and the noise provoked by the fœtus. 4. The sound of the capillary circulation. 5. The slightest sound produced in any diseased condition of the body; hence it is possible to draw on the body dimensions, the position, or any alteration in the position of the various organs and of the fluids which have gathered in the most important cavities of the body. 6. The sounds in the ear, the eye, the bladder, the stomach, and the intestines. The instrument consists of a circular, flat metal box or tympanum, having on its one surface two apertures for the attachment of the rubber ear tubes, while the other surface is formed by a thin disk which is readily thrown into vibration. The best results are obtained by simply applying this disk to the surface to be examined. By an ingenious contrivance a second disk can be superposed upon this one and a vulcanite rod attached to the former, so that the area of auscultation may be extremely circumscribed. The conduction of the sounds is only slightly diminished by the use of this rod, which thus combines the principle of the solid stethoscope with that of the tympanum. The rod furnished with the instrument is about two inches in length, but it is stated that there are other rods of various lengths to enable the "phonendoscopist" to receive sound vibrations from the natural cavities which communicate with the exterior of the body. Altogether we (Lancet) consider the instrument highly ingenious, carefully and compactly constructed, useful as an aid to auscultation, but yet not likely to entirely supersede the use of the stethoscope. It may also be found useful in class demonstration, since it would be easy by means of branched tubes to enable several persons to listen at the same time.

Measurement of High Temperatures.

The Chemiker Zeitung gives some extracts from a paper on this subject by Herr L. Holborn and Herr W. Wien (Wied. Ann. Phys. Chem.) There are three methods by which high temperatures may be measured. The first uses an air thermometer of refractory material; the second depends on the change in the resistance of a platinum wire with change in temperature; and the third is based on the employment of a thermocouple of difficultly fusible metals. The air thermometer method was valueless until recently, as suitable vessels could not be made. But now they are produced from some refractory clays, and permit of measurements of temperatures up to 1 500° C. (2,732° Fah.) The results are, however, vitiated by the effects of capillarity in the interior of the vessel. The resistance method has some great disadvantages. At high temperatures the absolute resistance generally increases constantly; but the coefficient of the temperature diminishes very irregularly. The presence of free hydrogen also affects the resistance; and the wire must therefore at least be calibrated before and after use. The third or thermopile method has proved the best. The most favorable circuit consists of platinum and an alloy of platinum with 10 per cent of rhodium. The increase in the electromotive force of such an element is exactly proportional to the temperature No substance, except carbon, affects the constancy of the couple; and temperatures up to 1,600° C. (2,912° Fah.) can be measured by it.

Electricity Direct from Carbon.*

BY DR. ALFRED COEHN.

The problem of the direct production of electricity from carbon would find its simplest solution if we could succeed in dissolving carbon in a fluid, just as we do metals. This question is formulated thus by the theory of electrolysis: Can carbon form ions?

In attempting to find an answer to this question, I started from an observation made by Bartoli and Papasogli, that when dilute sulphuric acid was electrolyzed between carbon electrodes, the carbon anode takes part in the electrolytic processes in such a way that, besides oxygen, both carbonic oxide and carbonic acid make their appearance at the anode. I commenced my experiments by varying the important factors, viz., concentration, temperature, and current density, in order to discover whether it was possible to obtain the products of combustion without admixture of oxygen on the anode. I have not succeeded in obtaining carbonic acid or carbonic oxide alone, but a mixture of the two, containing only one per cent of oxygen. In this mixture about 70 per cent was carbonic acid and 30 per cent carbonic oxide.

In these experiments it was observed that at low temperatures a disintegration of the carbon anode took place, small particles of carbon being seen suspended in the acid. At higher temperatures, on the contrary, no such disintegration of the carbon took place, but a distinct coloration of the acid was produced—at first yellow, then later dark red and red brown. If this is a solution of the carbon brought about by the current, the carbon is presumably contained in it, in the form of ions, i. e., in a form capable of being influenced by the directing power of the current. Such a solution must be capable of giving up carbon to the cathode, since carbon does not decompose water. (A series of platinum plates, coated with carbon, was shown, and a dish, such as is used by Classen for quantitative electrolytic analysis, was shown coated inside with a dense layer of carbon.) The solution and precipitation could readily be obtained with different kinds of coal as anode. Ordinary coal ground smooth, and arc lamp carbons, were found specially suitable; the experiment also succeeded with coke.

That the precipitate was really carbon, and not metal derived from impurities in the coal, was shown by treatment with acids. It was not attacked by hydrochloric acid; in hot nitric acid traces were dissolved—as in the calorimetric test for carbon in steel. In the flame, even the densest precipitates completely disappeared immediately. Finally, a direct proof was obtained by oxidizing the precipitated carbon by chromic acid, and absorbing the resulting carbonic acid in alkali. A number of analyses were made, and these always showed, in addition to carbon, a little hydrogen. The residue—reckoned as oxygen—was sufficient to convert the hydrogen found into water. Either, therefore, in addition to the carbon, a solid, conducting carbohydrate was separated, or some kind of crystalline water which adhered strongly to the carbon was produced. The presence of water in the precipitate is indicated by its behavior with concentrated sulphuric acid. If the acid is dropped on the precipitate it is immediately loosened and blackened, reminding one of the behavior of sulphuric acid with a carbohydrate.

It was now of interest to attempt to construct an element whose soluble electrode consisted of carbon. The only question now was to place a more electronegative element opposite the carbon. The peroxides stand still nearer even than carbon to the negative end of the potential series. Lead peroxide was used in the practical form of a charged accumulator plate. If this is placed opposite a carbon in sulphuric acid of the proper concentration, temperature, etc., an element is formed of which carbon is the soluble electrode. The element supplies a strong and constant current. Through an external resistance of 100 ohms it shows an E.M.F. of 1·03 volt.

There arises here the question whether any share in the production of the current is due to the reactions on the carbon, and if so, what share? Platinum also, when placed opposite a peroxide plate under the same conditions, shows a current in the same direction as the carbon. But it never comes to a visible development of oxygen; as soon as the platinum is charged with oxygen, the current becomes exceedingly small. If the carbon was an insoluble electrode, it would behave in the same way. But this is not the case. The current lasts till the accumulator plate is discharged. A second charged peroxide plate may then be substituted, and the current is again produced as strong as before.

The results of my investigation may be summarized as follows:

1. It is possible by electrolysis to produce a solution of carbon.

2. From such a solution, carbon may be separated as a cation.

3. An element may be formed of which carbon is the soluble electrode.

* Angelegenheiten des Elektrotechnischen Vereins; Elekt. tech. Zeit., March 19, 1896, p. 190.—From the Electrical Review.

Dry Plates for Radiography.

At a meeting of the Royal Photographic Society, says the English Mechanic, Mr. H. Snowden Ward read a paper on "Dry Plates for Radiography," in which he gave an account of experiments with seventeen varieties of plates, the duration of the exposures varying from one to four minutes with a two inch to three-inch spark, development being by means of a standard ferrous-oxalate developer at 60° F. With regard to the correspondence between light sensitiveness and X ray sensitiveness, it appeared that plates fairly sensitive to daylight were needed for radiography, but some curious observations were made: for instance, a plate which read about 130 H and D gave immensely better results than plates by the same makers reading 158 and 331. A plate specially prepared for radiography gave a very dense deposit of silver all over, even under a safety strip of copper and lead. Dr. Hesekiel has exposed a dry plate beneath a packet of a dozen sheets of bromide paper, obtaining good images alike on plate and papers, which seemed to suggest that speed would be increased in direct proportion to thickness of coating. Experiments with one make of plate confirmed this idea; but, with a different plare, the result was quite opposite, though this was probably due to an error on the part of the platemaker with regard to the double coating. Soaking the plates in solutions of fluorescent salts tended rather to loss of sensitiveness than to increase of speed, and celluloid apparently had no advantage over glass as a support for the sensitive film. The results of a large series of tests were shown by means of tables of comparative readings, indicating, among other points, that, with a suitable film, increase of thickness was a decided advantage, and that the amount of silver present was an important factor.

A New Elementary Substance.

E. Demarcay publishes evidence in support of a suggestion that a hitherto unknown element exists in the rare earths yielding samarium. From these earths he has obtained a colorless, slightly soluble nitrate, showing only slight traces of the absorption bands of samarium, together with the spectrum of gadolinum, an element discovered by Marignac, and other lines not belonging to that spectrum. The oxide prepared from this nitrate is distinguished by its lack of color, the formation of colorless salts without absorption spectra, and differences between its spectrum and those of the oxides of lanthanum, cerium, gadolinum, ytterbium and terbium, the only ones so far known that form colorless salts. It is further distinguished from lanthanum and cerium oxides by its relatively feeble basicity and the solubility of its double potassium sulphate; from ytterbium oxide it is distinguished by its relatively strong basicity and the slight solubility of its double sulphate; but it strongly resembles the oxides of gadolinum and samarium, the use of the spectroscope being required to distinguish it from them. The new element is provisionally designated as Σ, and its oxide is therefore Σ_2O_3. It is stated that spectrum analysis also indicates the existence of another oxide, but further comment on this point is deferred. Since samarium oxide prepared by Cleve, and supposed by him to be pure, has been found by Demarcay to contain definite traces of terbium and gadolinum oxides, together with a considerable proportion of the newly discovered oxide, it is suggested that the atomic weight ascribed to samarium (150) may probably require to be modified.—Comp. Rend., cxxii, 728.

Effect of "Bicycle Boom" on Trade.

The New York correspondent of the Philadelphia Ledger writes to that paper that "there has been much discussion of late as to the effect on other trades of the big boom in bicycles. The New York Journal of Commerce recently had a long editorial on the subject, and trade papers have generally discussed it. Recently the New York Journal devoted a page to the matter. It estimates the loss to other trades at $112,500,000 a year, and yet it leaves out of its calculation several items that might with reason have been incorporated. It has been generally known that the livery business and the carriage trade had been seriously hurt, but it has lately been made known that the demand for pianos, jewelry, watches and confectionery has fallen off materially. It is stated that less whisky and lager are drunk, fewer cigars smoked and fewer books bought on account of bicycles. The theaters complain that they are obliged to close much earlier in the season because their patrons prefer wheeling to seeing plays. One way of arriving at the financial effect of the bicycle craze on a different basis than that of the Journal is to estimate the year's output of wheels at 1.000,000. As the average cost of wheels is about $75, it follows that $75.000,000 will be expended this year for wheels, and is thus diverted from other lines of trade. What is gain for the bicycle makers, Bradstreet's adds, is a clear loss to other business men."