A Vacuum a Good Conductor.

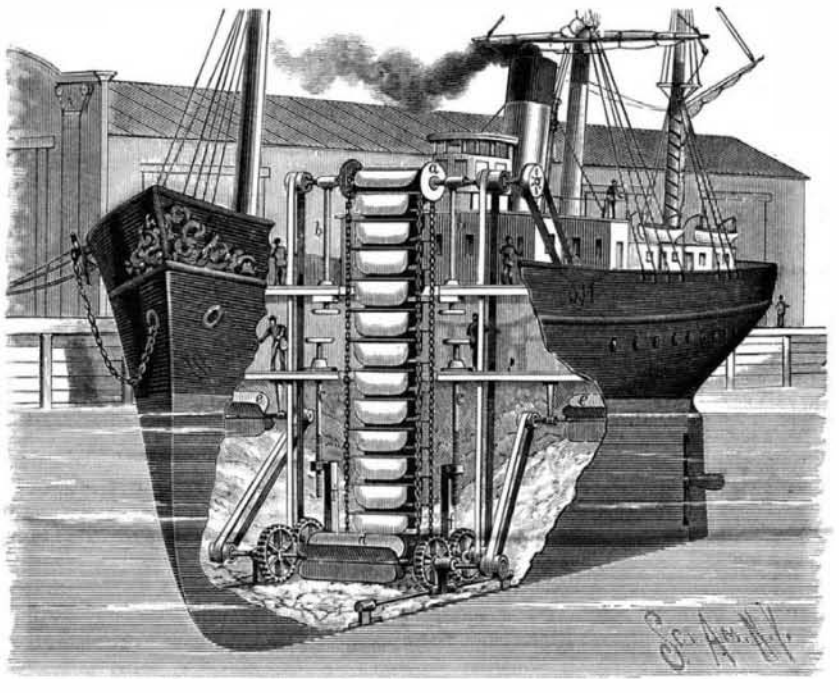
Professor Edland has communicated an important paper to the Royal Academy of Science, Sweden, in which he adduces further proof of his discovery that a perfect vacuum is a good conductor of electricity. This result is directly opposed to the current doctrine that a vacuum is a perfect insulator. The reason why a Torricellian vacuum is not traversed by an electric current is due to the fact that there exists at the points of the electrodes an obstacle to the discharge of the current, and this obstacle is augmented as the air is rarefied. If the current could be introduced into the vacuum without electrodes, it would be able to pass through the void without difficulty. The conclusion he arrives at from his recent elaborate experiments is that the maximum attained by the current intensity at a certain pressure of the air when a curent traverses a rarefied air space is not due in any way, as generally assumed, to the resistance between the electrodes by the air having its minimum at that pressure, and afterward increasing in amount with the increase of rarefaction, but to the fact that the sum of the electromotive of the spark and this resistance then possesses its minimum value. With the continuation of the rarefaction the resistance of the column of gas diminishes; but the electromotive force increases. Without employing electrodes at all, M. Edland can by induction easily excite luminous effects in a gas sufficiently rarefied to stop the passage of a powerful current from electrodes. But this would in his opinion be impossible if a highly rarefied gas were an insulator.

Imitation Stained Glass.

Among the many uses of the printing press none is more novel than the production of imitation stained glass. Designs for any pattern desired are engraved on wood. The blocks of wood are placed on an old fashioned hand press, and then are inked with oil colors compounded with special reference to the use for which they are intended. Then a sheet of very thin hand-made porous paper is laid on, and a prolonged impression given, in order that the color may thoroughly permeate the paper. Each color is, of course, printed at a separate impression. Having completed the printing process, the different pieces of paper which compose the design are soaked in warm water half an hour, taken out, the water sponged off, and then coated on one side with a thin cement. A similar coat of cement is given the glass to which the paper is to be applied, and then the paper is laid on in place, and varnished over. The plain glass window becomes at once, to all appearances, a window of stained glass. The effects of the lead lines, the irregular pieces of colored glass, the heads of saints and soldiers, the antique, or the modern Japanese designs are all to be had as brilliant in color as any imitation can be expected to be of the genuine glass. The glass thus prepared costs about one-tenth as much as genuine stained glass, and can, when it requires it, be washed without fear of injuring the surface.

IMPROVED GRAIN ELEVATOR.

The accompanying illustration represents a grain elevator designed to take all the grain out of the hold of a vessel without the aid of men. Journaled horizontally in standards, *b*, on the deck is a shaft provided with a central pulley, *a*, and a pulley at either end. Another shaft arranged with a central and end pulleys is journaled beneath the deck in arms, *f*, connected at their upper ends with vertically arranged screws, *c*, which work in corresponding nuts in the deck. An endless belt provided with buckets passes around the central pulleys working through openings in the deck. On the outer end of the lower shaft is a pulley, and a third shaft carrying a rotary shovel is also provided with a pulley, the two pulleys being connected by a belt. Cog wheels may take the place of the pulleys, as shown in the engraving. Upon power being applied to the upper shaft the endless belt will move, elevating the grain from the hold. The object of the rotary shovel is to bring the grain into such a position as to be readily taken up by the buckets. Other rotary shovels may be placed at suitable points, as *e e*. The standards, *b*, are provided with screws beneath the deck which work in threaded holes in the interior of the standards. These screws are provided with fixed collars secured to the deck in order to prevent the screws from slipping vertically; the standards are by this means raised or depressed. By means of the screws, *c*, and those just described, the elevator may be adjusted to any height.



BARDEEN'S IMPROVED GRAIN ELEVATOR.

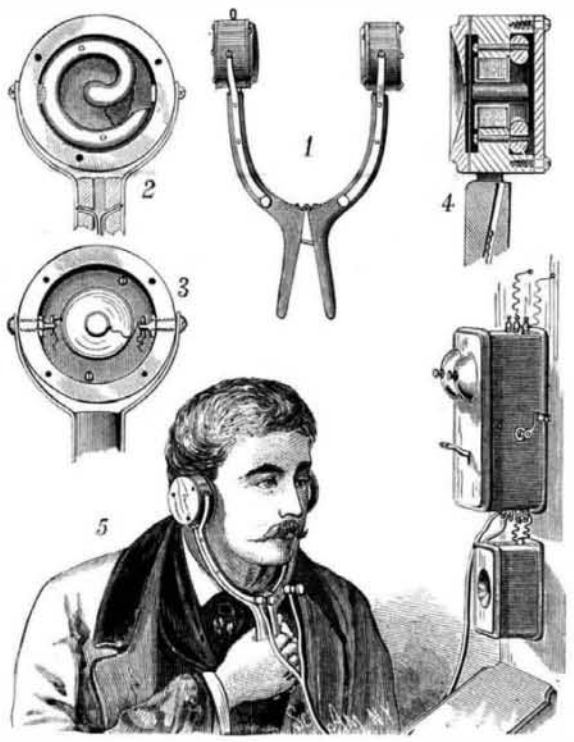
This invention has been patented by Amy Bardeen, of Blackstone, Mass.

Preserving Autumn Leaves.

The leaves may be pressed between sheets of blotting paper, which are changed at intervals, until the leaves are thoroughly dried, in order to prevent rotting. The colors then look dull, but may be brought out by either oil, a thin white varnish, or wax. The leaves may be rubbed with wax and carefully pressed with a warm, not hot, flatiron, and by carefully rubbing with the edge of the iron they may be made to curl most naturally.

ADJUSTABLE TELEPHONE RECEIVER.

In the telephone herewith illustrated, two curved rods are hinged to each other at the upper ends of the handle pieces, so that when the handles are pressed together the upper ends of the rods will be separated, as shown in Fig. 1. A spring attached to one handle piece rests against the other and presses them apart; a hook prevents the handles from moving too far from each other. To the upper end of each rod is attached a fork formed of two insulated metal bands, and in each fork is pivoted a cup in such a manner that the diaphragms face each other. The cups each contain a coil surrounding a magnet. Fig. 2 is a rear view of the



BARNARD'S ADJUSTABLE TELEPHONE RECEIVER.

cup, showing the magnet: Fig. 3 is a front view, with the diaphragm removed; and Fig. 4 is a vertical section. One end of the wire of the coil is connected with one of the strips forming the fork and the other end with the other strip. By means of a wire one strip is connected with the corresponding half of the hinge, and the other strip is connected with a binding screw on the rod. The line wires are attached to these binding screws.

The connecting wires pass through channels in the rods. To use the instrument (Fig. 5) the handle pieces are pressed together, thus separating the cups, when the head is passed between the rods; and upon the handles being slightly released the spring holds the cups closely against the ears. The current passes from one binding post through the corresponding wire to the coil, back to the hinge, through the wire to the other coil, and thence to the second binding post. The advantage of placing a receiver to both ears is apparent. The construction insures a fit against the ears of heads of all sizes. We have tried this receiver with most satisfactory results, the sounds being clear and loud, and entirely free from annoyances arising from local noises.

This invention has been patented by Mr. Daniel G. Barnard, of Winslow, N. J.

THE official returns show that the healthiest class of people in Great Britain are the inmates of prisons, where simple diet, regular hours, and exercise are compulsory. But the cases of insanity among the convicts are out of proportion to the number of other ailments. To commit a crime a man must be more or less mad.

The Armor Plated Ship not a Modern Invention.

An old book entitled "A Universal History," published by J. Coote, London, 1759, contains the following:

"The invention of ships is very ancient, since God himself gave the first model thereof to Noah, for the building of his ark, to save the human race from the waters of the deluge.

"The first celebrated ships of antiquity, besides this ark, are that of Ptolemy Philopater, which was 280 cubits long, 38 broad, and 48 high; it carried 400 rowers, 400 sailors, and 3,000 soldiers. That which the same prince made to sail on the Nile, we are told, was half a stadium long. Yet these were nothing in comparison with Hiero's ship, built under the direction of Archimedes; on the structure whereof Moschion, as we are told by Snellius, wrote a whole volume. There was wood enough employed in it to make fifty galleys; it had all the variety of apartments of a palace, banqueting rooms, galleries, gardens, fish ponds, stables, mills, baths, a temple of Venus, etc.

"It was encompassed with an iron rampart, eight towers, with walls and bulwarks, furnished with machines of war; particularly one, which threw a stone of 300 pounds or a dart 12 cubits long, the space of half a mile; with many other particulars related by Athenæus."

One of the above original books is now or lately was in the possession of James E. Serrell, C. E., of this city.

The United States Foreign Mail Service.

The annual report of the Superintendent of Foreign Mail states that the letter mail dispatched during the year increased 77 per cent over the amount sent in 1880, and the printed matter increased 74 per cent. The number of letters sent to countries not in the Postal Union, excluding Canada, was 410,600. The sum paid for sea transportation of mails was $316,322; of this amount $263,621 were paid for trans-Atlantic service; $19,251 for trans-Pacific, and $33,649 for West Indies, the Isthmus, and other routes. The estimated amount of postage collected in the United States on foreign mail matter was $2,078,913.

Death from Cold in Mammals.

The behavior of protoplasm under the influence of different degrees of temperature is still unsufficiently known. We are familiar with the general facts that excessive heat or cold brings about death, and that fever is attended with increased tissue changes; and in some measure we understand the kind of way in which this happens; but that is all. MM. Richet and Rondeau have studied the influence of cold on some mammals. They have adopted a method by which the temperature of animals has been gradually lowered. Dogs resist cold so well that no experiments were made on them. Rabbits were chiefly employed in these investigations.

These animals were shaved and surrounded with flexible pewter tubes, through which cold water was made to circulate. When the temperature of the body was lowered to 25° C., respiration began to be ineffectual. The rhythm was not modified; but the amplitude of the inspirations was chiefly diminished. The functions of the nervous system were much abated when the temperature fell to 17° C.; they were not, however, abolished. Reflex movements were obtained, even when the temperature sank to 15° or 14° C.; and the observers believe that the excitability of the nervous system disappeared not directly on account of the cold, but probably from arrest of the circulation. Spontaneous movements disappear before the reflex acts. The reflex from the cornea went before those from the lower limbs. At 16° C. the reflexes were remarkably slow and like those in animals with a cold circulation. Sensibility to pain was not abolished even at the temperature of 16° C. Cold gradually slowed the cardiac action.

The form of the contraction at 17° C. was like that of the heart of the tortoise. Systole commenced at the auricles, and by a slow vermicular movement passed on to the ventricles. Even although death had been apparent for half an hour, the animal could be restored to life; so that vitality can be recalled half an hour after the cessation of respiration and circulation. When the temperature was 19° C., it took more than ten minutes to asphyxiate the rabbit by blocking the trachea. We may conclude from this that tissue metabolism is correspondingly slow. The same animal was suffocated in four minutes at a temperature of 32° C.

MM. Richet and Rondeau commented on the similarity between the vital processes of hibernating animals and those of rabbits thus experimented upon, in which a condition, so to speak, of artificial hibernation may be induced.—*Lancet.*

Perosmic Acid

Is a new remedy employed by Professor Winiwarter in cancerous and scrofulous swellings. It is used by injecting daily three drops of a one per cent solution of the acid, which treatment causes the tumor to soften and decrease in size; the dead tissue is thrown off, and disappears in about a month. No curative effects upon cancer itself have been observed from the remedy.—*Rundschau, Leitm.*

Inventions and Inventors.

The beginning of inventions is very remote. The first idea, born within some unknown brain, passes thence into others, and at last comes forth complete, after a parturition, it may be, of centuries. One starts the idea, another develops it, and so on progressively, until at last it is elaborated and worked out in practice; but the first not less than the last is entitled to his share in the merit of the invention, were it only possible to measure and apportion it duly. Sometimes a great original mind strikes upon some new vein of hidden power, and gives a powerful impulse to the inventive faculties of man which lasts through generations. More frequently, however, inventions are not entirely new, but modifications of contrivances previously known, though to a few, and not yet brought into practical use. Glancing back over the history of mechanism, we occasionally see an invention seemingly full born, when suddenly it drops out of sight, and we hear no more of it for centuries. It is then taken up *de novo* by some inventor, stimulated by the needs of his time, and falling again upon the track, he recovers the old foot marks, follows them up, and completes the work.

There is also such a thing as inventions being born before their time, the advanced mind of one generation projecting that which cannot be executed for want of the requisite means; but in due process of time, when mechanism has got abreast of the original idea, it is at length carried out, and thus it is modern inventors are enabled to effect many objects which their predecessors had tried in vain to accomplish. As Louis Napoleon has said, "Inventions born before their time must remain useless until the level of common intellects rises to comprehend them." For this reason, misfortune is often the lot of the inventor before his time, though glory and profit may belong to his successors. Hence the gift of inventing not unfrequently involves a yoke of sorrow. Many of the greatest inventors have lived neglected, and died unrequited, before their merits could be recognized and estimated. Even if they succeed, they raise up hosts of enemies in the persons whose methods they propose to supersede. Envy, malice, and detraction meet them in all their forms; they are assailed by combinations of rich and unscrupulous persons to wrest from them the profits of their ingenuity; and last, and worst of all, the successful inventor often finds his claims to originality decried, and himself branded as a copyist and a pirate.

Among the inventions born out of time, and before the world could make adequate use of them, we can only find space to allude to a few, though they are so many that one is not disposed to accept the words of Chaucer as true, that "There is nothing new but has once been old;" or, as another writer puts it, "There is nothing new but what has before been known and forgotten;" or, in the words of Solomon, "The thing that hath been is that which shall be, and there is no new thing under the sun." One of the most important of these is the use of steam, which was well known to the ancients; but though it was used to grind drugs, to turn a spit, and to excite the wonder and fear of the credulous, a long time elapsed before it became employed as a useful motive power. The inquiries and experiments on the subject extended through many ages.

Friar Bacon, who flourished in the thirteenth century, seems fully to have anticipated, in the following remarkable passage, nearly all that steam could accomplish, as well as the hydraulic engine and the diving bell, though the flying machine yet remains to be invented: "I will now," says the friar, "mention some of the wonderful works of art and nature in which there is nothing of magic, and which magic could not perform. Instruments may be made by which the largest ships, with only one man guiding them, will be carried with greater velocity than if they were full of sailors. Chariots may be constructed that will move with incredible rapidity without the help of animals. Instruments of flying may be formed in which a man sitting at his ease and meditating on any subject may beat the air with his artificial wings after the manner of birds. A small instrument may be made to raise or depress the greatest weights. An instrument may be fabricated by which one man may draw a thousand men to him by force and against their will, as also machines which will enable men to walk at the bottom of the seas or rivers without danger."—*Aldebaran, in the American Artisan.*

The Roman Baths at Bath, England.

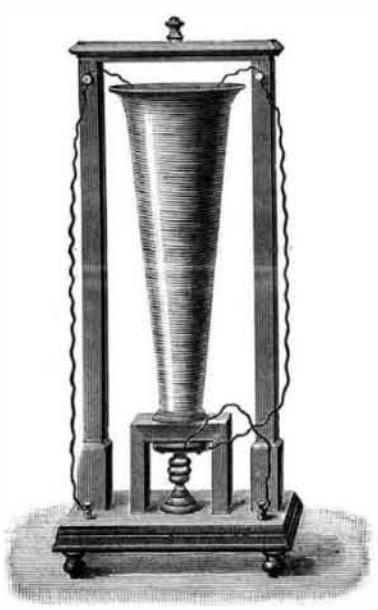
It is well known that the pleasant city and medicinal watering place called Bath was the Aquæ Solis of the Romans, when Britain was a province of their empire; and some interesting traces of their occupation of this place have been discovered from time to time during the past five years. The excavations begun by the Municipal Corporation have been carried on by the Bath Antiquities Committee, assisted by the London Society of Antiquaries and by private subscribers; but more funds are still required. The hot springs appear to have been protected, under Roman management, by an octagonal structure, built of massive stone and cased inside with lead, beneath the modern Pump Room.

The greatest discovery has been that of a large bath, 81 feet in length by 38 feet 10 inches in width, with steps complete at its four sides, floored with blocks of masonry, on which still remains the original coating of lead. The bath was supplied by the hot mineral water, and had a hatch or sluice of bronze (now deposited in the Pump Room) for conveniently emptying it. The bath is in the center of a large hall with *scholæ* all round, in length 110 feet, width 68 feet 6 inches. The floor of this hall is at a depth 20 feet below the neighboring street; above part of its site are the offices of the Poor Law Board, which have been underpinned and supported by arches, while other large buildings have been purchased and removed by the Corporation.

The ancient Roman masonry stands yet upward of 10 feet above the floor of the hall, which consists of three aisles, the center being the width of the bath, vaulted by a barrel vault. The vault sprang from an arcade of clustered pilasters, giving seven arches on either side. The pilasters, 2 feet in diameter, of solid block, stand on Attic bases and plain pedestals; the side aisles or *scholæ* were arched and groined, with attached pilasters along the walls and three recesses (*exedræ* or *stibadia*) 15 feet wide, on each side the hall; two being semicircular, and the third and central one square. In the center bay of the northern arcade is a defaced piece of sculpture, through which ran the water. Below the sculpture is a recess in the steps marking the position of a large sarcophagus (now lost), into which the water was first poured and so overflowed into the bath. The entrance to the great bath is at the western end, by a doorway from a large hall, the precise extent of which is unknown. Very fine fragments of architectural sculpture have been obtained; also a metal mask somewhat similar to those of Dr. Schliemann, several patens and ewers of metal, and an engraved tablet, another tablet in cursive character, a large number of coins, bones, and pottery, and lastly a teal's egg, evidently in the position it was laid by the bird against one of the ruined pilasters of the bath in the decayed vegetation; this little token of nature proves that the city of Aquæ Solis (Bath) continued a deserted ruin for a lengthened period after its destruction by the Saxons, A.D. 577.—*Illustrated London News.*

THE ELECTRO-MAGNETOPHONE.

At the Munich Exhibition of Electricity Mr. Weigele exhibited a series of interesting acoustic apparatus. Among these there was one called by the inventor an electro magnetophone. This instrument, which is shown in the accompanying cut, consists of a tin disk fixed at the bottom of a hollow cone, and having above it an electro-magnet, and beneath it a mercury cup into which dips a metallic point. When the current passes, the electro-magnet attracts the disk and breaks the contact with the mercury, the current ceases to pass, and the contact is set up again, so that the disk is set in motion in the same way as the vibrator of a Ruhmkorff coil. There may be thus obtained from 400 to 440 vibrations per second. The sound that is produced is very intense, and the inventor thinks that it will be possible to obtain in this way sounds loud enough to be employed as fog signals.—*La Lumiere Electrique.*



THE ELECTRO-MAGNETOPHONE.

"Doctoring" Hides and "Making Weight" in Leather.

The proportion of American tanners using East India hides is not great, but several large tanneries annually produce a good deal of leather therefrom, mostly used in the medium and common qualities of boots and shoes manufactured in New England. The high prices for all classes of hides, as compared with the rates for leather since 1879, have caused an unusually active demand for these cheaper East India goods, particularly of the heavier grades. But hides are only heavy according to the species and growth of the animals from which they may be taken. To make enough hides of the weights most desired, therefore, the natives have been pasting or plastering lighter ones with a mixture called in the trade "chenam"—variously compounded, but probably like the plaster "chunam." In this way American tanners have bought many tons of East India dirt, paying therefor the cost of good hides and freight charges, besides being put to no little expense in removing it from the hide. This practice has prevailed to some extent for many years, but it seems the very height of assumption on the part of the producers, and of foolishness on the part of the tanners, had been reached during the past season, when, as stated by the *Shoe and Leather Reporter*, Patna hides weighing an average of 10 pounds each have been sold thus "doctored" to weigh an average of 14 pounds. The "weighting" of salted hides, with the question of proper tare thereon to make an average of hides in properly merchantable condition, has always been the cause of much dispute between the tanners and our home hide producers, but we believe the latter have never yet attempted anything quite so audacious as seems to have been successfully carried out by the Oriental hide dealers.

In this connection it may not be inappropriate to refer to a related branch of the same subject. All tanners who make leather to sell by the pound are not as particular as they should be as to its quality, if only the appearance is as it should be. In sole leather the buyer can always judge pretty well as to what he is purchasing, though even here he is liable occasionally to be compelled to pay for a good deal more water than should be sold in properly merchantable goods. But when we come to harness leather, calfskins, and many kinds of upper stock for boots and shoes, the practice of overstuffing with cheap oils, to "make weight," is so general that those who follow the opposite practice may be said to form exceptions to the common rule. All large manufacturers, and many of the smaller ones, know this so well that it cannot be said to be generally a fraud as between the first bargainers, as is the case in the "doctoring" of hides, but the practice is quite as much to be deprecated as being not only a wasteful method of manufacture, but as really constituting a virtual deception of many of the less capable judges, and being an injury to the public.

Glucose vs. Cane Sugar and Sorghum.

When corn was so cheap at the West that it was in many places used as fuel in lieu of firewood, the glucose industry seemed all at once to blossom into full activity. This was a little over three years ago. The business had theretofore been conducted on a pretty large scale, but so quietly that the public in general had hardly any knowledge of such an industry until its attention was invited by the publication of full details relating thereto, in the course of an important and highly sensational lawsuit in the western part of New York State. The particulars then presented as to the extreme cheapness of production, at a time when corn was selling at 25 cents a bushel, and the extent to which it had been substituted and unwittingly used for cane sugar, though possessing only a small part of the sweetness of the latter, attracted universal attention, and had a twofold result. The first was to induce the investment of large amounts of capital in the manufacture of glucose sugar and sirup, extensive establishments therefor springing up in many places almost as if by magic. But the investors in this instance seem to have been a little too hasty. The public also had "seen the papers," and consumers generally had become acquainted with the difference between cane sugar and glucose.

It was quickly understood that an admixture of glucose in granulated sugars could be readily detected by the different appearance as to crystallization, while in the powdered and brown sugars, and in the beautiful sirups, where glucose had been largely used as an adulterant, people had only to have their attention called to the inferior sweetness of the glucose compounds to see the advantages of cane sugar. Manufacturers of confectionery, who were at first large users of the new product, discontinued its use to a great extent, certainly in all their better productions; the brewers, who had begun to employ it largely, have likewise almost entirely ceased therefrom, owing to the popular demand that they should do so, and no responsible merchant of any standing would now attempt knowingly to sell a sugar adulterated with glucose as the pure product of the cane. In this way, while the facilities for manufacturing glucose were being largely increased, the demand therefor was being diminished in a yet greater ratio. Many thousands of dollars have thus been utterly sunk by the investors, some large establishments being entirely idle, and others, owned by parties who at first attempted to buy up or crowd out opposition, doing only a small and unremunerative business.

With the present promising outlook for a large production, from sorghum, of sugar in no way distinguishable from that made from the sugar cane, there seems little probability that the glucose manufacture will ever again assume the important position it temporarily held, while the new industry gives every indication of "coming to stay."

Gilding Leather.

We find in the *Papierzeitung* the following method described for gilding leather. It is first moistened with a sponge, then stretched and tacked on a board. When dry it receives a coat of thick isinglass solution, then one of white of egg that has been beaten and allowed to settle. Upon this is laid lightly with a brush sheets of *silver foil*, which are then pressed down with a wad of cotton wool. When this is dry it is painted over with yellow leather varnish, which gives it a beautiful golden appearance.

A varnish for bronze boots and slippers is made by dissolving aniline red in shellac or other varnish. P. N.

Neuralgia Treated by the Tuning Fork.

Dr. Rasori applies the tuning fork, while vibrating, over the course of the painful nerve. The sitting usually lasts about half an hour, and the patient is generally relieved without further treatment. He records his method in the *Cinn. Lan. and Clin.*