Magnetic Iron Sand in New Zealand.

From the report of the United States Consul at Auckland, New Zealand, it appears that the government of that colony offers a bonus of £1,000 ($5,000) to whoever will first produce, from native ore, in the colony, 200 tons of iron in blooms. In answer to this demand a furnace was established on February 8, at Auckland, the furnace being on the plan of the invention of Joel Wilson, of New Jersey. The managers claim that they can manufacture iron in Auckland much cheaper than it can be brought from England. The consul says that the United States government has granted as many as thirty-eight patents for electric separators of iron ore, and that one of these was successfully operated in the separation of iron sand obtained at Block Island, off the Connecticut coast, by the patentee, D. C. McCotter Arthur, who cleaned one hundred and twenty tons per day by means of his magnetic separator.

Similar means for procuring the pure iron free from sand have been tested in New Zealand, so far that a furnace on the American plan has been established at Onehunga, a few miles from Auckland.

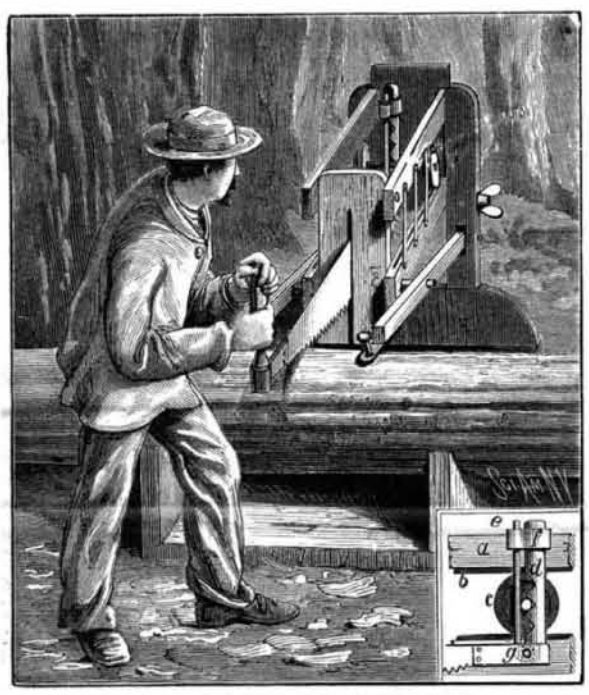
This iron sand is so pure that a portion sent to England was worked into steel for cutlery without the intermediary of puddling, being melted, cast, and at once forged under the hammer. The supply is absolutely unlimited, and cannot be estimated even by millions of tons. The ordinary yield of the sand is from fifty to seventy per cent of the mass. The magnitude of the deposits may be inferred, if not comprehended, by the statement that in the neighborhood of Waniku, in the province of Auckland, the area of this magnetic iron sand is so great that it extends from the shore miles in width and in length, submerging rocks, trees, shrubs, and covering even the tops of the distant hills.

The existence of this iron sand was well known to the earlier voyagers and later to whalemen and venturesome traders. On approaching the shore the masters of vessels that first visited these islands noticed a variation in the magnetic needle of their compasses, and attributed it to deposits of loadstone along the beach.

This deposit, the consul thinks, was formed by the action of the sea, of running streams, leaping torrents, and profuse rainfalls on cliffs, banks, and soil that hold in loose embrace the heavy particles of iron originating in volcanic rocks. The sand is of a bright blue, its attrition of particles preventing the settlement into the red oxide which would cement its grains, and it is in so fine particles as to be easily driven by the wind, forming on levels or easy slopes wavy, undulating ridges that simulate the waves of the sea.

CROSS CUT SAW FRAME.

The log is arranged on supports at one end of the base, and at the other end of the base is an upright frame fitted with guide grooves, in which the head of the saw frame can be shifted up and down when it becomes necessary to raise or lower the saw guides for altering the height of the saw, and can be secured in any position by a bolt and nut. Attached to the rear uprights are braces, extending upward and forward, to be employed for staying the logs by dogs. The bars for the support of the rails are pivoted to the braces at a point a little short of where the log rests. These bars, shown at *a*, in the small figure, are connected by stays, and between their forward ends is a vertical bar provided



SCHOOLEY'S CROSS CUT SAW FRAME.

with a slot in which a saw is free to rise and fall. The saw is connected at the end which runs in the guides to the axle of the wheels, *c*, by the notched handle, *d*, and the rod, *e*, which is pivoted at *g*, and secured to the upper end of the handle by a ring, *f*, so that by slipping the ring off the upper end of the handle the rod may be swung back to allow the saw to be set up or down as required. The handle extends up between the upper bars of the guides for holding the saw in a vertical plane. The wheels run between rails, *b*, on the guides.

This invention has been patented by Mr. Andrew Schooley, of Litchfield, N. Y

HOLLOW AUGER.

In the work of forming tenons on the ends of wheel spokes, and in similar work, the article is first pointed down with a knife or fore auger, as the hollow augers will not take hold upon the blunt end of the spoke. This is obviated by the hollow auger recently patented by Mr. James A. Rodman, of Lebanon, Texas. The head or yoke is made in one piece of a ∩-form, and is provided with a shank for being clamped in place. At the lower end of the head are the jaws, *a b*, Fig. 1, forming the hollow auger, *a* being what is termed the "off jaw," and *b* the jaw carrying the cutter. The two jaws are attached at one end by a pivot pin, so that they may be moved according to the size of tenon that is to be cut. Thin outer or moving ends are at-

RODMAN'S HOLLOW AUGER.

tached to the opposite leg of the head by a clamping screw which passes through a slot in the leg, so that the jaws may be held firmly, and a graduated scale is provided for adjusting. An arm having forked ends is pivoted to each side of the head, and at the lower ends are formed the flaring jaws of the fore auger, one of which is fitted with a cutter. These jaws come beneath the jaws of the hollow auger when the arms are brought together, and in this position they are held by the latches, *c c*, the ends of which catch into the jaws, *a b*. A spring, serving to spread the forked arms when they are released, is indicated by the saw-tooth line at the top of Fig. 1. In one of the arms of the head is a slot in which moves the stop, *f*, regulating the depth to which the spoke enters the tool and consequently the length of the tenon. In using the tool the jaws, *a b*, are set to the diameter of the tenon to be cut, the stop, *f*, is adjusted, the arms are brought together, and the latches caught. The tool being applied to the spoke, the fore auger bevels the end. When the beveled end reaches the triggers, they are raised, when the arms spring out, leaving the hollow auger free to act.

Roof Water as a Motive Power.

It has occurred to a gentleman resident in Georgetown, West Indies, that a possibly valuable source of energy is allowed to run to waste in the tropics in the shape of the water which pours off the roofs of the houses whenever there is a shower. The gentleman in question, in a lecture delivered recently before a local society, said that, "having been frequently struck by the great volume of water discharged from roofs during heavy tropical rains, it occurred to me that the power so wasted might be utilized in some way by converting it into electricity by the following means: The water from each roof might be conducted into one main downpipe, in which would work a small turbine wheel driving a dynamo electric machine, the electricity so developed by every passing shower to be stored in accumulators of the type of Faure's secondary batteries. These, as they became charged in variable time, depending on the rainfall, could be collected and stored at central depots, from whence the power could afterward be distributed uniformly, either by electro dynamic engines, or utilized directly for electric lighting!"

The Value of a Compost Heap.

The gardener and farmer are not apt to sufficiently appreciate the importance of gathering into heaps vegetable substances of all kinds to convert into manure. *Land and Water*, calling the attention of its readers to the subject, suggests the following plan for a compost receptacle:

In some convenient place lay down a sound floor of concrete, and have a roof to cover it, but open at the sides. Upon the floor collect weeds and every other kind of waste vegetable matter, road scrapings, border edgings, in fact the greater the variety and the more of it the better. Keep it moist (not over wet), and turn it over occasionally—at the same time a little salt may be sprinkled over it with great advantage. When sufficiently decomposed this will form a most valuable manure, highly rich in nitrogen in such a form as to be readily taken up by the crops. Use the liquid of cattle and the domestic liquid waste from the house, and it will surprise many what a store of good manure will soon accumulate.

The Creosoting of Timber.

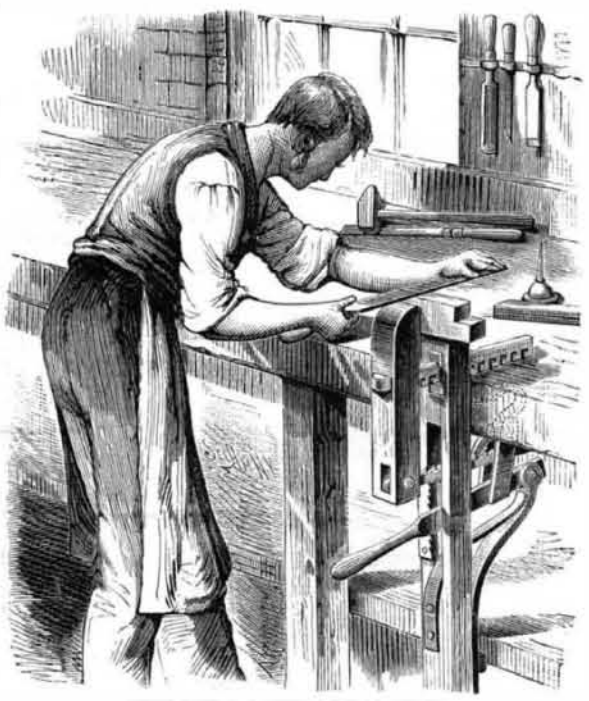
As is well known, the preservative properties of creosote are owing to its preventing the absorption of the atmosphere in any form, or under any change of temperature. It is noxious to animal or vegetable life; and it arrests all fermentation of the sap, which is one of the primary causes of dry rot and other species of decay in timber. The action of creosote—says Mr. Bale, in his work on "Saw Mills: Their Arrangement and Management"—may be thus described: When injected into a piece of wood, the creosote coagulates the albumen, thus preventing any putrefactive decomposition; and the bituminous oils enter the whole of the capillary tubes, incasing the woody fiber as with a shield and closing up the whole of the pores, so as to entirely exclude both moisture (water) and air. By using creosote, inferior porous timber and that cut at the wrong season, and therefore sappy, may be rendered durable. The Bethell system of creosoting is as follows: The timber is first thoroughly seasoned and cut to the required dimensions. It is then placed in a wrought iron cylinder, fitted with doors that can be hermetically closed by means of wrought iron clamps. The air and moisture contained in the wood are then exhausted from it, and from the cylinder, by means of a powerful air pump. The pores of the wood being now empty, the preservative material (creosote oil) is admitted into the tank. When the wood has received all that it will after this manner, more oil is forced into it by means of hydrostatic pumps, exerting a pressure of 120 pounds to 200 pounds per square inch. This pressure is maintained until it appears that the proper quantity of creosote oil has been absorbed by the wood, which is determined by a gauge. Timber intended for railway sleepers, bridges, etc., should absorb 7 pounds of oil per cubic foot; and timber required to be protected against marine insects, etc., requires at least 10 pounds of oil per cubic foot. The cost varies from 4d. to 5d. per cubic foot, according to the quantity of oil required.

Cable Telegraphy.

According to recent trials of the speed of working on the Jay Gould cables laid across the Atlantic from Penzance to Canso, in Nova Scotia, 1,000 code words were sent from Penzance and received at the Canso station in 81 minutes, including all repetitions and corrections. The 1,000 words consisted of 7,288 letters, which is about equivalent to 1,458 words of 5 letters each, the average number for the English language. The above rate of transmission is therefore equal to 18 words of 5 letters per minute.

IMPROVED VISE.

The vise herewith illustrated is constructed with two vertical jaws, each provided near the upper end with a slot. A bar having hook teeth on its bottom edge is pivoted in the slot of the outer jaw, passing through the other slot, the teeth of the bar projecting toward the front. On the rear surface of the inner jaw is a slotted plate, on the bottom cross piece of which the hooked teeth of the bar catch. A bar which has its upper edge toothed and its lower edge beveled is pivoted to the lower end of the outer jaw and passes through a slot in the other jaw. The beveled edge rests upon a grooved roller in the slot. An arm is secured



ANDERSON'S IMPROVED VISE.

to the inner jaw, and to its upper end is pivoted a lever, which passes through a slot, on one side of which is a ratchet plate. Attached to the lever just in front of the pivot is an arm, to whose upper end is fastened a spring, and also a pawl engaging with the teeth on the upper edge of the lower bar. When the handle of the lever is moved downward, the pawl moves the lower bar and consequently the lower part of the front jaw forward, closing the jaws upon the work. The ratchet plate holds the lever at any elevation

This invention has been patented by Mr. William T. Anderson, of Rock Hill, S. C.

A Vacuum a Good Conductor.

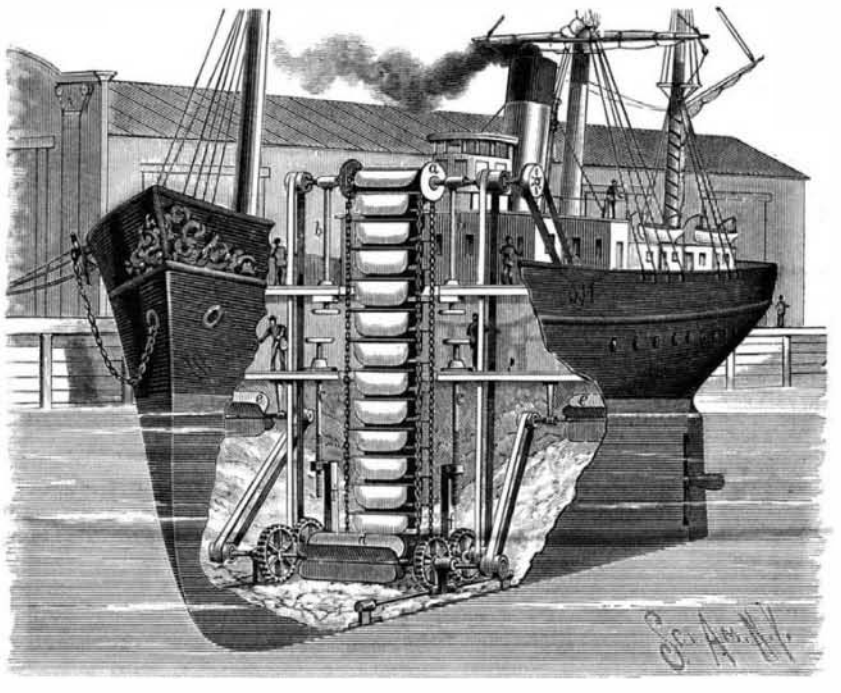
Professor Edland has communicated an important paper to the Royal Academy of Science, Sweden, in which he adduces further proof of his discovery that a perfect vacuum is a good conductor of electricity. This result is directly opposed to the current doctrine that a vacuum is a perfect insulator. The 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.

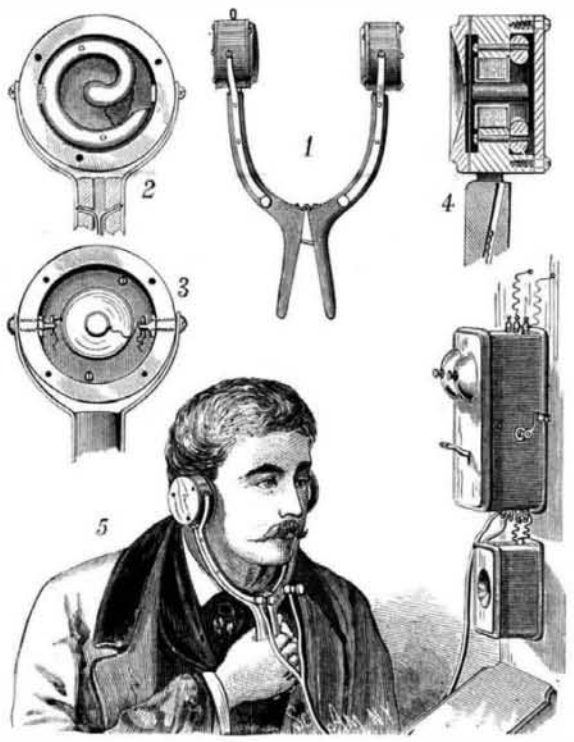
This invention has been patented by Amy Bardeen, of Blackstone, Mass.

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.*