Science Notes.

The Prince of Wales, President of the Society of Arts, recently presented to Prof. D. E. Hughes, F.R.S., at Marlborough House, the Albert Medal, awarded him by the Council of the Society "in recognition of the services he had rendered to arts, manufactures, and commerce, by his numerous inventions in electricity and magnetism, especially the printing telegraph and microphone."

A bill has been introduced into the Legislature of the State of New York which authorizes the city of New York to spend $2,500,000 in the erection of a library building on the site of the old reservoir in Bryant Park, or rather adjoining it. The income of the Astor, Lenox and Tilden foundation is about $160,000 annually; so that, if the building were provided, this would be sufficient to maintain a great reference and circulating library in the city of New York.

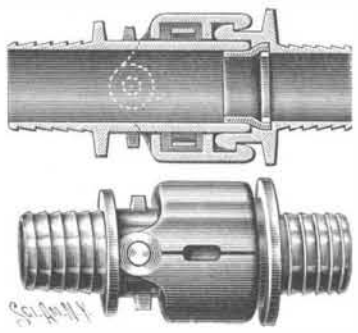
Vertical earth-air electric currents were first revealed by Dr. Adolf Schmidt, of Gotha, says Nature. In his mathematical analysis of the earth's magnetic field—the most carefully executed analysis upto date—he reached the following conclusion: The earth's total magnetic force consists of three parts, viz.: (1) The greatest part; this is to be referred to causes within the earth's crust, and possesses a potential. (2) The smallest part, about one-fortieth of the entire force; this is due to causes outside of the earth's crust, and likewise possesses a potential. (3) A somewhat larger part than the preceding; this does not possess a potential, and, in consequence, points to the existence of vertical electric currents. These currents amount, on the average, for the earth's entire surface to one-sixth of an ampere per square kilometer. The existence of such currents is indicated by the non vanishing of the line integral of the earth's horizontal magnetic force resolved along a closed curve of the earth's surface. Gauss carried out this test in a special case, and finding the integral practically zero, he assumed that the entire force is due to a potential. More recently, Prof. Rücker applied the same test. He found "no evidence in favor of the existence of vertical currents" over a region of the earth—the British Isles—which had been very minutely surveyed. The results of some preliminary investigations being confirmatory of Schmidt's conclusion, Dr. L. A. Bauer determined to carry out the test in a thoroughly systematic manner, viz., to take as the closed curves parallels of latitude, on which he read a paper recently before the Philosophical Society of Washington. The results obtained confirm those of Dr. Schmidt's more elaborate investigation. Summing up, Dr. Bauer finds that: "There are vertical electric currents which pass from the air into the earth, and back again into the air. Between 60 deg. N. and 60 deg. S. the average current intensity per square kilometer is about one-tenth of an ampere."

Sound Waves as Revealed by the Phonograph.

In a recent lecture on the above subject, says the Practical Engineer, delivered by Professor McKendrick at the third ordinary meeting of the Philosophical Society of Glasgow, the author, after describing the general nature of sound waves both simple and compound, gave a short description of the phono-autograph, an instrument which might be regarded as the precursor of the phonograph. By means of this instrument the vibrations of membranes could be recorded on a moving surface. He then described the general mechanism of the phonograph, and showed the various methods by which he had attempted to explain the peculiar marks made on the wax cylinder by the vibrations of sound. Photographs of outlines of the surface showed in a general way the number of vibrations, but they did not give the form of the vibrations. This led to the invention of a special apparatus—which was exhibited in operation—by which Professor McKendrick took advantage of the siphon recorder of Lord Kelvin, as used for ocean telegraphy. This instrument was adapted by special modifications to the phonograph, and the latter was caused to move with extreme slowness. In this way each vibration was recorded upon a long slip of paper rolled out by the machine, and the number and form of the vibrations as produced by musical sounds and by words were recorded. The lecturer then proceeded to analyze a word, and showed that it consisted of a succession of musical tones varying in pitch and in quality according to the voice of the speaker. The number of vibrations in many words was much greater than might have been anticipated. He took as an example the word "Constantinople," which, spoken by a rapid speaker, had as many as 700 or 800 vibrations. This could not be regarded as a system of shorthand, but it showed how nature constructed the sounds of words. Professor McKendrick also illustrated by experiment how the tones of the phonograph may be intensified, and how they may be caused to appeal to deaf people by stimulating the skin of the hands. It could not be said that the deaf heard by this method. That was impossible. But they could catch much of the time and rhythm of music. Possibly the method could be developed into a means of communicating with the brain of the deaf and dumb by the nerves of the skin.

A SIMPLE AND EFFICIENT FIRE HOSE COUPLING.

The coupling shown in the illustration is designed to facilitate the quick connection of two sections of hose and prevent leakage at the joint. It has been patented by John Kerns, of No. 601 West Fifty-second Street, New York City. On opposite sides of a short metal tube forming the end of one section are short pins on which are pivoted clamp jaws or hook members of general semicircular form, encircling the outer end of the tube, there being between the main bodies of the jaws and the tube a spring, and the jaws having an interior flange forming a stop for the hooks of the mating section. The springs act normally to draw the outer hooks toward each other, and an elongated aperture is formed partly in each jaw for the insertion of a tool to pry the jaws apart. The other coupling section has a ring or neck on which is an annular hook adapted to be engaged by the hooks of the jaws when the two parts of the coupling are pushed together, the meeting faces being rounded to insure automatic opening of the jaws and engagement of the opposing hooks. Within the second section of the coupling there is also held a packing nipple or ring, the other end of which enters the opposite section when the parts are coupled, thus making a tight joint, which the pressure of the water only makes the tighter. At the outer end of each section is an externally ridged neck to receive the hose, and collars serve as stops and guards for the ends of the hose.



KERNS' HOSE COUPLING.

Orders from Switzerland.

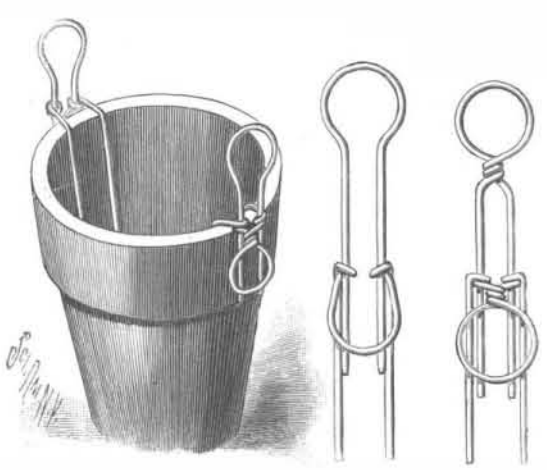
There is an inviting field for American fire apparatus in Switzerland, according to recent advices from the United States consul at Zurich. A fireman's smoke protector of American manufacture has been ordered by H. Schiess, chief of the fire department at Zurich, and if it stands the test of practicability, all of the fire departments in Switzerland will be equipped with it.

Chief Schiess has also asked Consul Germain to put him in communication with American manufacturers of firemen's portable electric lamps and other firemen's electrical appliances. The consul has transmitted the request to the State Department at Washington, with the suggestion that official notice be given to American manufacturers of firemen's life protecting inventions. The consul promises to report the results of such tests of American appliances as may be made in Zurich.

"All the fire departments of Switzerland belong to the Union of Swiss Fire Departments," writes Col. Germain, "and whatever new fire appliances one department should conclude to supply themselves with will be followed, if proved satisfactory, with orders from the other Swiss fire departments. I may add that no steam or chemical engines are in use in Switzerland, and that the old hand engines are still being used. With proper efforts, perhaps this also opens a new ground to prospect."

SIMPLE HANDLE FOR FLOWER POTS, DISHES, ETC.

To facilitate the handling of flower pots in greenhouses and other places, and also to serve as a handle for plates, saucers, etc., the simple and inexpensive device shown in the illustration has been invented and patented by William C. Krick, of No. 1287 Broadway, Brooklyn, N. Y. The device is made of wire, and consists of two parts, one of which forms a staple adapted to be inserted inside the pot, while it is bent over the upper edge of the pot and formed with eyes to receive the shanks of a lifting staple or handle, the wire of the latter being bent in various forms, of which two modifications are shown in the small figures.



KRICK'S HANDLE FOR FLOWER POTS ETC.

Education in Russia.

Through the rapid growth of Russian power in Europe and in the far East we have presented a great collision of moral forces embodied in the civilizations respectively of the empire of the Czar and of Great Britain, says the Independent. This spectacle imparts a special interest to everything by which the tendencies of Russian influence may be gaged. Is it a power making for darkness or for light? The educational test is not an unfair one, and certainly in the two departments of technical and of diplomatic training Russia may give lessons to the world. But what does her supremacy promise for popular enlightenment? The answer is suggested by her illiterate population, seventy per cent of the total. More impressive yet is the dark cloud that settles down upon provinces that have been or are in the process of being Russianized.

A few decades since the Baltic provinces had excellent schools, and in Courland especially instruction was general. Now many of the peasants, the children and grandchildren of literate parents, are unable to read and write, because they are forced to learn the Russian language, which they do not comprehend. In the interior of Russia it is estimated that there are 5,000 villages without a schoolhouse, in hundreds there are houses but no teachers. Besides, the snows and storms in winter are so severe that pupils often cannot reach the school, if one exists, for several days. Even in the spring, when the snows are melting, the roads are frequently impassable. These causes, with the innumerable holidays (i. e., church and fete days), reduce schooling to a ridiculously short period. In St. Petersburg itself, where the conditions are vastly better, it is admitted that the schools are generally overcrowded and inconveniently placed, and that from six thousand to ten thousand children of school age are kept from instruction by the want of accommodation. The mayor of the city has recently urged the necessity of a compulsory school law, while admitting, however, that there is no prospect of securing such a measure.

The Development of Russian Industry.

The British consul at Moscow, in a report on the Nijni Novgorod exhibition, describes the industrial progress of Russia since the Moscow exhibition of 1882 as very great. The progress made in textiles is marvelous, and many of the silk and print exhibits equaled anything that Lyons or Manchester could produce. The machinery section was full of good work, but agricultural machinery left much to be desired. In the mines section there were some wonderful pieces of iron work which would attract attention in any country; but although the constant remark was that every object was purely Russian, British and German foremen are largely employed in the iron works, Frenchmen in the silk and many of the print works; while British subjects have still very much to do with the cotton mills. The development of the natural wealth of the country is even greater than that of the manufactures. The production of coal has trebled in the last fifteen years.

Cotton planting prospers in Tashkent and Erivan, and the results in the new plantations of the Southern Caucasus are excellent. Costly experiments near Baku have produced a Russian tea, which is shown with much pride, and General Annenkoff is planting American vines in Turkestan; tobacco is also being grown from American seed near Samarkand. Generally speaking, every branch of industry has improved, except agriculture, which grows worse year by year. Mr. Medhurst thinks that Great Britain should still be able to supply Russia with portable engines, high pressure steam boilers, steam thrashing machinery, heavy iron plows, bicycles, and machine tools.

Calico and kindred stuffs appear to be made sufficiently well at prices which are so low that they must affect British trade; but he thinks some years must elapse before Russia can construct satisfactory spinning machinery in sufficient quantities to affect British makers. He saw nothing in the hardware section to alarm our manufacturers of high class goods, and, generally, he came to the conclusion that the trade in cheap goods is slipping away from us, but where high class articles of the best materials are required, it is admitted that the British stand first, except in Manchester goods. The consul says that when England first permitted the export of spinning and weaving machinery, in 1843, there were 350,000 spindles in all Russia, which produced yearly 5,600 tons of yarns.

In 1895 there were 5,000,000 spindles and 200,000 looms at work, producing 161,300 tons of yarns and giving employment to 400,000 hands. British and German foremen are being gradually replaced by Russians, and attempts have been made—with very indifferent results so far—to supplant British machinery by that made in Russia. Efforts to provide her own raw material have been more fortunate. In 1883 the total value of cotton goods produced in Russia was £27,790,000 and in 1892 it amounted to £38,470,000. The Russian silk trade has prospered since 1875. The woolen industry is not so prosperous. The best Russian cloth is made by an English firm, settled near St. Petersburg since 1841, which employs 2,160 hands.

The Peril of the Wire.

The overhead electric wire is responsible for many disasters to life and limb. A long list of tragedies can be credited to this cause. Fatalities are frequent, says the Age of Steel. An electric wire in its right place is a potent factor in modern business, but when, by the stress of service, time, or weather, it breaks from its holdings, and hangs like a fiery snake over the heads and at the feet of pedestrians, it is as deadly as a cobra in the tropics. It is a serpent of science, when out of its place, as it is one of its best servants when in midair. The Railway Gazette, in a recent issue, has given some startling figures of mortalities due to falling wires. In a compilation of accidents, obtained from press reports for the five months from May to September of last year, the following was obtained. As the sources of information were fragmentary and incomplete, the figures given are but an approximation of the total. From falling trolley wires there were 122 accidents; in 11 of these 12 persons were killed, and in 28 cases 31 persons were injured, and in 18 instances 24 horses were killed. Forty accidents occurred from falling electric and telephone wires, in which 9 persons were killed, 27 injured, and 7 horses made into calcined meat. Human fatalities for the period named numbered 21. At the same ratio for a period of twelve months, the death roll would include 50 persons. In contrasting this total of fatalities with those occurring on steam railroads, the Railway Gazette says, that for the year 1895 the railway mortuary list included but 38 passengers killed. Thus the deadly wire clearly outclasses the split rail, the misplaced switch, or the broken tie, or bridge. It is evident from these facts that some plan for the better protection of human life from falling wires is needed. How best to bring it about may be more or less a problem, but of its urgent necessity there can be no division of opinion. The overhead system, however carefully constructed and secured, cannot, from the very nature of things, be otherwise than a menace to public safety. In many of our cities, the lines of wires are thick and numerous as the threads in a spider's web. They outclass the complicated ravel of a full-rigged ship, and in sheer weight alone, at contiguous and intersecting points, are many tons in weight. In heavy winds, or local conflagrations, and under masses of debris or snow, the danger of these overhanging masses of copper and cable is increased. It is, moreover, a fact that, however rigid and close inspection may be, the detection of weakness and the prevention of sudden dislocation is not always possible. Wires will continue to fall, and citizens to be electrocuted, in spite of all precautions, and the death roll will still employ its copper pen until legislation supervises the deadly scribe. It has thrown its protecting shield over the railway and the mine, and sooner or later it will have a word to say on the perils of the wire.

Our Medicinal Herbs and Plants.

BY GEORGE ETHELBERT WALSH.

Forty years ago a New England kitchen garden was not considered complete without a collection of medicinal herbs for home use, such as sage, saffron, chamomile, wormwood and burdock, and all the early almanacs contained information about gathering, drying, and preparing these plants for internal and external application. It is so rare to find a garden to-day containing any of these useful plants that the question is often asked if people no longer employ them for medicinal purposes, and if the substitution of chemicals and minerals has not entirely killed the trade in herbs.

No statistics are published by the wholesale druggists to show just how many tons of common medicinal plants are consumed in this country every year; but the best informed dealers agree that twice as many are used to-day as in earlier times. The only difference is that the good housewife now goes to the drug store for her supply of herbs instead of raising them herself, and great numbers of herb gatherers and professional growers make a business of supplying the wholesale botanical druggists with the various plants. The trade in these medicinal herbs is enormous, and every wholesale botanical druggist must carry between one thousand and one thousand five hundred different plants in stock. The minerals used by the druggists are few compared with the herbs and plants, such as potash, arsenic, alum, sulphur, salt, iron, and lime, in their various forms. These are compounded in various ways with the medicinal plants, and constitute the bulk of the medicines dispensed to the public.

The manufacturers of patent medicines use great quantities of plants, but, as they generally confine themselves to the cheap ones, their supplies are made up chiefly of twenty or thirty of the common roots and barks. Some of the large concerns use twenty to thirty tons of these roots and barks a year, and many smaller ones use half that quantity.

Germany, France, and Italy send considerable quantities of medicinal plants to this country, but the American growths are considered best, and the leading druggists prefer to handle them alone. The imported horehound, centaury, coltsfoot, daisy flowers, and the roots of burdock and angelica sell at from three to ten cents a pound cheaper than the American products, and patent medicine manufacturers who have to go into the market to purchase their supplies generally take the imported because of the difference in price. The American growths are generally stronger, and cured under better conditions, and are well worth the extra price demanded. The European countries also send us aconite, belladonna, conium, feverfew, foxglove, henbane, marigold flowers, stramonium, sage, wormwood, and the balms, but, owing to duties on these, the prices are more equalized.

On the other hand, we export considerable quantities of certain medicinal plants to London and other European ports, such as lobelia and hemlock bark, and the extracted medicinal principles of many others. By exporting the alkaloids the bulk is reduced and transportation rates cut in two. The most prominent of these shipped to Europe are podophyllin, leptandrin, sanguinaria, sinecin and euonymin.

Most of the medicinal herbs grow wild in this country, and they are gathered from the woods and fields by professional herb pickers; but a few are regularly cultivated on farms and gardens. Most of the peppermint for distilling oil is grown in New York and Michigan. Sage is raised extensively on farms in Massachusetts, New York and Michigan. Nevertheless, we import over 100 tons of sage every year, and after paying three cents a pound duty it is sold at $80 and $85 per ton. The American sage brings as high as $140 per ton, and yet not more than twenty tons are raised here. Owing to the demand for it here and the inadequacy of the home supply, French and German growers have in late years been sending us a pure and superior article that brings even more than the American product. The cheap imported sage comes chiefly from Italy.

The mountains of North Carolina and Tennessee yield great quantities of medicinal herbs for the trade. Most of them grow wild there, and the pickers make a living in gathering the plants for the market at the proper season. Probably twenty tons of boneset, pennyroyal and thorn apple leaves come from these Southern mountain districts every year, and forty to fifty tons of mandrake, Culver's root, golden seal, garget root, blood root and black cohosh.

Most of the medicinal herbs that grow wild in New England are considered superior to those raised anywhere else. Almost without exception the herbs raised in New England bring $20 to $40 per ton more than those gathered in the Southern or Western States.

Until quite recently the chief supply of saffron came from Vermont, but a severe drought there killed so many of the plants that the price advanced from fifty cents a pound to $6 and $8 per pound. This induced the growers in the West and in Mexico to enter into the cultivation of saffron, and the price dropped at times as low as twenty and fourteen cents a pound. But three times since 1846 the price has run up to $5 per pound.

The common garden wormwood thrives in many old, neglected gardens, and the trade demands considerable quantities of it, but very few make a business of growing it. A good deal of this is distilled for the oil, and is often sold in bar rooms under the name of absinthe. Sixty years ago farmers raised most of it in New York and Vermont, but other farm crops crowded out the plant, and the supply comes chiefly from the wild growths in various parts of the country. France and Germany both send wormwood here, which sells about the same as the best American, although some of the imported wormwood is cheaper. Probably five times as much wormwood is imported as our farmers at home raise.

The Pacific coast sends a great many medicinal herbs to the large markets, and patent medicine men who buy their barks and roots generally go direct to the mountains of Tennessee or to the Pacific coast and make annual contracts for the delivery of a certain number of tons. California produces ten or twelve tons of horehound annually, and this, with the amount raised at Cape Cod, enters into competition with the horehound imported from Mexico and Germany.

The medicinal herbs that are in great demand to-day and which are used twenty times as much as they were in earlier days, make a pretty formidable list. Chief among the roots that have increased in popularity are Culver's root, mandrake, blood root, yellow dock, dandelion, burdock, angelica, bayberry, bitter root or dogsbane, blue flag, elecampane, golden seal, garget or pigeon berry, lady's slipper, pleurisy root, senega or snake root, spikenard, sarsaparilla, unicorn root and jessamine root. The barks of the following trees, shrubs and plants have also become of great value to the medical world, and they have steadily increased in popular favor with druggists and physicians: Prickly ash, barberry, black haws, buckthorn, cascarilla, cherry, cohosh or blacksnake root, cotton root, cramp bark and slippery elm. Of the herbs, the chief ones are: Arnica, belladonna, boneset, catmint, clover blossoms, elder blossoms, fireweed, gold thread, gravel plant, or trailing arbutus or Mayflower, henbane or night shade, horehound, sage, liverwort, squaw vine or partridge berry, pennyroyal, skull cap, balmony, thorn apple leaves, thyme, water pepper or smart weed and wintergreen.

Most of these plants grow wild, and there is little systematic effort to cultivate them, but here and there gardeners attempt to cultivate them in gardens and fields with fair success. Besides these mentioned, there are others that always sell well whether gathered from their wild state or cultivated in the garden. Among these, mention should be made of wormwood, motherwort, lemon and sweet balm, burdock root, comfrey root, yellow dock, hyssop, garden lettuce, marshmallow root, and the leaves of parsley, poppy, stramonium or thorn apple, Jamestown weed and stink weed, valerian, peppermint, spearmint, summer savory and rue.

There are many other herbs and plants which every large wholesale dealer must keep in stock, but which have not increased much in demand. They are only occasionally called for, and the demand is so limited that the wild plants supply the market easily. These are agrimony, angustura, sweet balsam, betony, borage, buck bean, bugle herb, bitter clover, cocash, dittany, haircap moss, lungwort, masterwort, milkweed, mugwort, yellow parilla, sometimes called Texas sarsaparilla, resin weed, scabish, vervain and yarrow.

Of late years ginseng has grown into favor in this country, and the herb gatherers of Tennessee, North Carolina and West Virginia make considerable in gathering it. Ginseng is shipped to China in large quantities, where it is generally accepted as possessing marvelous curative virtues. The trade in it is steady and will continue as long as the Chinese believe in its medicinal virtues. All through the Appalachian region ginseng abounds, and some is found in New Jersey, but the roots are being gathered so freely that the supply will in time run short. Attempts to cultivate ginseng in the South have so far failed, but with the right conditions there is no reason why it should not flourish in gardens or fields. There are probably a quarter of a million pounds of this root exported, and it is sold all the way from fifty cents to several dollars per pound, according to its quality. In China, the best ginseng comes from Manchuria, known as the "imperial," and is sold only to the wealthy, who frequently pay fabulous prices for it. The second grade is collected in Corea, while the ginseng used by the common and poorer classes is gathered in the United States. In China this latter sells from $2 to $5 a pound, while the "imperial" may bring $40, $50 and $100 a pound. The Chinese call ginseng "jen shan," and believe that only the most perfect grows in the Garden of the Gods, and that all else is merely an imitation. This superstition costs the Chinese many thousands of dollars, for, while the root has some medicinal value, it possesses no specially marvelous virtue.

Wonderful Things that are Near.

The Philadelphia Press foreshadows the coming of the millennium as follows:

Flying is solved. The principle is known. A mechanical expedient is all that is now needed to make it successful. Practical flight is to-day not more than five or ten years off.

A glow worm makes light with about one three-hundredth part of the force used in ordinary artificial light. When men know how to make light as cheap, streets and homes will be as light as day for a mere fraction of what light now costs. This is near. Vacuum illumination without incandescence is already in full operation, and in a year or two should cut down the price of light to a sixth of its current cost, and in five or ten years light may be, like water, turned on in every house at will.

Compressed air has long been known to be the best way, theoretically, to store force for use in transportation. There is no waste and no deterioration. The need is a cheap and efficient motor to apply compressed air to city transportation. If this can be done, first the trolley poles and wires will come down, next the horseless, compressed air motor carriage will do all the work of city delivery.

When these come the only use for gas will be for cooking—if this is not done by electricity. Factories, also, before many years, will be run by transmitted electric power. This has begun to be done and in five or ten years will be completed, and the factory fire and boiler will be a thing of the past.

The city of the future, and no very distant future, will have no trolley poles or wires and no horses. All movements will be on rail by silent air motors or by horseless carriages equally silent. All pavements will be asphalt. Unlimited light will be as cheap as unlimited water is to-day. No coal will be delivered at private houses and no ashes taken from them. With no horses, no coal and no ashes, street dust and dirt will be reduced to a minimum. With no factory fires and no kitchen or furnace fires, the air will be a pure in the city as in the country. Trees will have a chance; houses be warmed and lighted as easily and cheaply as they are now supplied with water.

A city will be a pretty nice place to live in when the first twenty years of the twentieth century are passed.