

Science Notes.

The Franklin Institute proposes to award the John Scott legacy medal and premium to the following parties for meritorious discoveries and inventions: To Lieut. George O. Squier and Albert C. Crehore, for their polarizing photo-chronograph; Joseph Richards, for his solder for aluminum; A. L. Johnston, for his bonding joint for electric railways.

MM. D'Arsonval and Charlan have proved by experiments that currents of high frequency attenuate the bacterial toxins. Toxines thus attenuated increase the resistance to infection of animals into which they have been injected.

Sir W. M. Conway proposes to take a party to Spitzbergen, in the summer of 1896, for the purpose of exploring the interior. He expects to be accompanied by several scientific experts, so that the journey promises to be very important from a scientific point of view. The island is penetrated with fjords and no part is very far from the sea. The explorers will therefore cross from fjord to fjord.

Prof. Alexander Agassiz has determined to undertake an expedition, the object of which is to investigate the many subjects connected with the great barrier reef of Australia. He will be accompanied by a trained staff of artists and assistants, and Mr. W. Ward, an experienced collector, will also go with him.

The New England Association of Opticians are raising funds to build a memorial to be erected to Robert B. Tolles, who lies buried at Mount Auburn, Cambridge, Mass. In their opinion, a man so honored as an optician deserves some remembrance.

M. Henri Moissan has produced carbide of uranium, and says that when formed with excess of carbon in the electric furnace the carbide is a definite and crystallized one, corresponding to the formula U_2C_3 ($U=240$). Cold water decomposes it, a third of the carbon being given off in the form of a mixture of gaseous hydrocarbons, of which three-quarters are methane and very little acetylene. Hydrogen is also present. The remainder of the carbon produces a mixture of liquid and solid carbides. It looks as though this reaction might prove a typical one for the carbides of several elements, says the Electrical Engineer.

Investigations made by Dr. Carl Müller, and reported in *Himmel und Erde*, show that lightning prefers to strike certain kinds of trees. Under the direction of the Lippe-Deilmold Department of Forestry, statistics were gathered showing that in eleven years lightning struck fifty-six oaks, three or four pines, twenty firs, but not a single beech tree, although seven-tenths of the trees were beech. It would seem, then, that one is safer in a storm under a beech tree than under any other kind.

The serum for snake bite sent from the Pasteur laboratory to the government bacteriologist at Agra has been used with success in the case of a native bitten by a cobra. A number of sheep that were bitten have been treated and saved. The report of the Pasteur Institute at Paris for last year shows that the number of persons treated were some 1,532, of whom only 5 died. Of these patients, 1,263 came from France and 93 from England and India.

The United States consul at Warsaw, Poland, reports that a second hygienic exposition, similar to the first, held in 1887, will take place at Warsaw. The date of the opening of the exposition will be May 15. It will continue for one month. The following list of the nine committees now at work will give an idea of the scope of the exposition: (1) physico-chemical; (2) parasitic; (3) architectural; (4) pedagogical; (5) on hygiene of industry; (6) on hospitals; (7) pharmaceutical; (8) statistical; (9) public hygiene. Each of the above committees is composed of at least three members, selected from among the doctors of medicine, professors, engineers, and other specialists, all under the presidency of the general committee.

Prof. Roentgen, of Wurzburg, has been created a baron by Prince Ludwig of Bavaria, in recognition of his services to science in the discovery of the new radiation.

Perhaps there is nothing that so clearly explains the intense ignorance of the Turks as the fact that the censors of Turkey prohibit the importation of all educational books, this state of affairs being brought about by the discovery in one book of the formula H_2O , which the wise men of the court interpreted to mean: "Hamid II is naught—a cipher—a nobody.—Digest of Physical Tests.

A Berlin physician has devised what seems to be a rather novel method of imitating mother's milk, says the *Medical Record*. Cow's milk is fermented by means of rennet, and the whey thus obtained is carefully sterilized and then enriched, as required by different individuals, by the addition of cream.

A memorial tablet of bronze, to the late Prof. George H. Williams, will be placed in the Williams memorial room of the geological laboratory of the Johns Hopkins University. This room contains the collections made by Prof. Williams.

At a recent meeting of the Physical Society, Sir David Salomons showed some very interesting experiments with incandescent lamps. A large electro-mag-

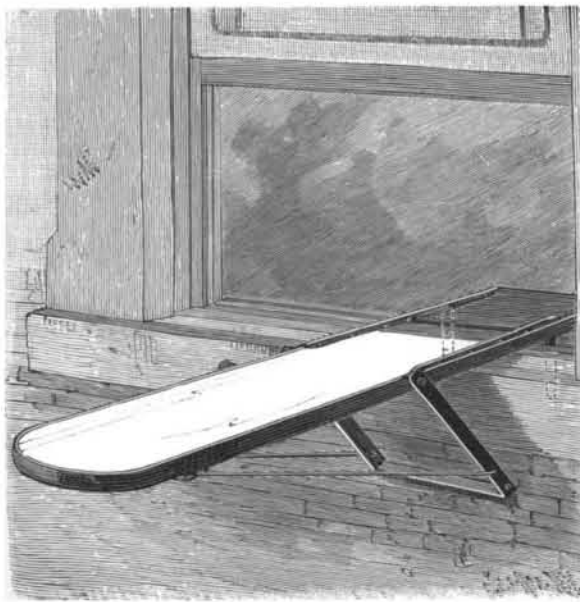
net was excited by means of a continuous current while an alternating current was passed through an incandescent lamp. On bringing the lamp near the magnet the filament was set in vibration, which was sufficient to break it. The number and position of the nodes formed in the vibrating filament are found to be independent of the natural period of the filament, but depend on the frequency of the alternating current.

There are now six sanitariums in Germany at which consumptives are treated by constant exposure to cold air at a low temperature. Currents of cold air are allowed to pass through the bedrooms at night, and during the day as much of the time as possible is passed in the open air. It is said that the pure, cold air quiets the cough, lowers the temperature, arrests night sweats, improves the appetite, and modifies or arrests the disease.

Mr. Edwin Wheeler, a naturalist of Clifton, Bristol, has just presented to the Natural History Museum the results of the labor of years, in the shape of 2,449 water color drawings from nature, and species of fungi to be found in Great Britain. The drawings make twelve bulky volumes.

A SERVICEABLE PLATFORM.

The illustration represents a simple construction adapted to conveniently support a person when painting or washing windows, and similar occupations, and which may also be employed in constructing scaffolds and other supports inside and outside of a building. It has been patented by F. H. Reeder and A. R. Saxton, of 665 Union Street, West Philadelphia, Pa. On the under side of the outer end of the platform is pivoted a brace connected with a yoke adapted to abut against the wall of the building, and on the inner end of the platform is adjustably held a key adapted to engage the



REEDER AND SAXTON'S PLATFORM.

inside of the wall in a room, the inner vertical portions of the key being covered with leather or other soft material to prevent injury to the walls or woodwork. The key has a U-shaped middle portion adapted to rest on top of the platform, and its sides abut against pins projecting from the sides of the platform, the outer ends of the pins being secured to a bail which embraces the inner end of the platform. The key locks the platform in place, so that it will readily support a person on its extended portion.

The Electrical Resistance of Bismuth.

Continuing their researches on the electrical properties of the metals at very low temperatures, Profs. Dewar and Fleming have recently investigated those of bismuth, and in the *Philosophical Magazine*, 1895 (5), 40, 303-311, they publish an interesting paper on the electrical resistance of this metal. The substance of the paper is as follows: The resistance was determined in the case of three samples of bismuth: (1) commercial pure bismuth (A); (2 and 3) pure samples specially prepared (B and C), the temperature varying from 95° to 235° (platinum degrees). In each case the specific resistance at first diminishes, a minimum being reached at 50° pt. (B), -83° pt. (C), and 0° (A); after this the resistance increased, the temperature coefficient being negative. In the case of the commercial bismuth (A), a maximum was reached at about -200° pt., after which the temperature coefficient was again positive; but in the two pure samples no such maximum occurred, neither was there any indication that a maximum would be reached. It is noticeable that the change in the temperature coefficient of the pure bismuth (especially C) occurs at about the same temperature as that of the discontinuity in the thermoelectric power. It is also found that the effect of a magnetic field on the resistance of the metal is very much increased by reduction of temperature, an increase of 5 per cent due to a magnetic field reaching 25 per cent at the temperature of liquid air.

Cycling Notes.

The Brooklyn Bridge is now free to wheelmen, the toll of one cent having been abolished.

Count Leo Tolstoi, the Russian novelist, now rides the wheel, much to the astonishment of the peasants on his estate.

Silk for tires has been produced by a French tire maker. The silk is used instead of cotton fabric in the special racing tire.

One of the newest uses to which the bicycle has been put is its introduction as an aid to the life savers in patrolling the beach.

It is said that all machines used in the French army are to be equipped with electric lights capable of being turned on or off at will.

The Patent Office statistics show, says the *American Wheelman*, that 2,388 styles of velocipedes have been patented in the last twenty-five years.

A company producing only one form of one part of a bicycle (the jointless rim) covers two acres of ground with its works at Birmingham, England.

It is said that last year barely five hundred tandems were ridden in the United States, but this year the call for the two seated wheel has been unprecedented.

The bicycle is proving of great use to the medical profession. In many cases the sick can be thankful that the doctor has a bicycle, and can thus be at the bedside in less time than that required for harnessing a horse.

An English trades union has refused to work with men who ride to their work on bicycles, on the ground that they have an unfair advantage in being able to work longer at the shop and yet get home at the same time as those who walk.

It is said that there are in and around New York City 150 cycling clubs, with a combined membership of 80,000. The annual dues amount to about \$1,900,000 and the total number of miles ridden by these members is about 35,000,000 each year.

Cycle racing was one of the most interesting of the sports of the Olympian games in Athens. There are now six cycling organizations in Greece; five of them are in Athens, where there are about 400 riders. There are said to be 1,500 in the entire country. Prince George is an enthusiastic wheelman and is president of one of the clubs. The Grecian women have also taken to cycling, and nearly 100 of the Athenians now ride wheels.

A French bicycle maker is using roller bearings in his machines, the rollers taking the place of the balls and being prevented from touching each other by a cage which revolves with them. It is said that in ball bearings there is considerable friction between the balls themselves, as the points of contact between them are necessarily revolving in opposite directions, and that so completely is friction overcome in the roller bearing that no oil need be used. Similar contrivances have been used before and have been very generally abandoned.

In some of the railroads in France a simple contrivance is used to store the wheels in the baggage compartments; it consists of a pair of tongs which grips on strips of the roof of the car. To these tongs are attached a leather covered hook by means of chains. The frame of the bicycle rests in this hook; the bicycle is also caught to the side of the car. This plan removes the wheel from the floor space of the car, so that it does not interfere with any other class of baggage. Some of the Western roads of the United States have already provided bicycle racks.

A large part of the bicycles which are transported by railroads are carried by local trains, in which passengers consist almost wholly of suburban residents who do not take with them any form of personal baggage, aside from bicycles; so it is not believed that the bill compelling bicycles to be carried the same as baggage, which will probably become a law in New York State, will work much hardship to the railroads. A railroad in the South charges for the transportation of wheels, and the wheelmen, many of whom were large shippers of freight, retaliated, so that it is said that the profits of the road were very much reduced by this action.

The manufacture of the modern bicycle presents some delicate problems in mechanical engineering, caused by what engineers call the "factor of safety," which is lower in the bicycle than in almost any other mechanical product. In high pressure guns the factor is even as great as twenty, which means that the guns are made twenty times as strong as is theoretically necessary for the strain they must bear. In boilers it is about six. In bridges usually five, and in almost every construction of machines it is at least four. These wide margins of extra strength are considered necessary as an offset to the defects in construction and material and errors in theoretical computations. Riders of wheels insist on lightness, and in the construction of the bicycle the factor of safety is reduced to a very small margin, being as low in some instances as 1.25. In view of this fact it is easy to understand why makers of high grade machines maintain such a rigid system of inspection in their works.

Electricity on Trunk Railroads.

BY WILLIAM BAXTER, JR.

When it became a demonstrated fact that electricity had achieved a complete success in the street railway field, the majority of electrical engineers claimed, or at least believed, that it would soon follow up its victory by an invasion of the trunk railways, and drive the locomotive off the tracks as effectually as it has driven off the horse cars. The main point on which they based their hopes for success was the supposed difference in coal consumption between compound and triple expansion condensing engines and the locomotive. They assumed that the latter burned from eight to ten pounds of coal per horse power hour, while the former could be depended upon to reduce the amount to something like one and a half pounds. It was soon shown by railroad experts, however, that high speed passenger engines are not so inefficient as the electrical engineers had assumed, and that on actual tests they could show results within four pounds per horse power hour. The difference between this figure and the best results obtained with triple expansion engines was not enough to show any great advantage in favor of electricity, after making the necessary deductions for the several losses in the transformation of energy and its conveyance to the moving trains upon the track.

These facts discouraged electrical engineers for the time being, but further investigation showed that, although the performance of locomotives on a test was highly efficient, the actual everyday results, as shown by the reports of a large number of roads, were considerably below these figures, and not very far from what they had been ordinarily supposed to be. Further investigation, on the other hand, shows that the average cost of fuel consumed by railroads amounts to about ten per cent of the total operating expenses; therefore, a saving of even half the coal would not be sufficient to justify the expenditure that would be necessary to equip a road electrically.

It would not be doing justice to electricity, however, to assume that the only way in which it could reduce the operating expenses of a road would be by effecting a saving in coal, for such is clearly not the case. A little reflection will show that, if consumption of coal and water along the track is stopped, the wages of all men employed in preparing them for use can be saved, and also the cost of repairs to water tanks, coal bunkers, etc. It is also evident that the cost of keeping locomotives in repair is greater than the amount that would be expended on motors doing the same work. The boiler and tender have no counterpart in the electric motor, therefore all the money expended in keeping these parts of a locomotive in repair would have to be checked off in estimating the difference between the cost of maintenance of electric motors and locomotives.

The smoothness of motion of the motor ought to materially reduce the wear and tear of the rolling stock as well as the roadway, and if the operation of trolley roads is anything to go by, the mileage of electric locomotives should be greater than that now covered by steam. Without going any further into details, it may be said that a careful analysis of the operating expenses of steam railroads will show a number of items that could in all probability be reduced by the adoption of electricity, and some that could be entirely eliminated. But, on the other hand, there would be other changes introduced, that would reduce to a considerable extent the apparent saving, so that it is far from certain that the net gain would be sufficient to pay the interest on the outlay that would be required to install an electric plant, although it might be enough to justify the adoption of the system for new roads.

Several branches of steam roads have been equipped electrically and their operation has been so successful as to lead to the belief that in this direction electricity will obtain a foothold; but most if not all of these branches run light cars, about half way between full size steam cars and trolley cars. Therefore, the results obtained on these branches are not a true indication of what could be done on the trunk lines, with full sized equipment.

The only electric installation where full size railroad cars are handled is that of the belt line tunnel in Baltimore. There the regular passenger and freight trains of the Baltimore and Ohio road are drawn through the tunnel by electric locomotives, and it has been demonstrated on several occasions that these motors are capable of doing the heaviest work that has ever been undertaken by steam.

Electrical engineers look upon the operation of this plant as a great triumph for electricity; but the friends of the locomotive take a diametrically opposite view. The former claim that this installation proves conclusively that electricity can handle with perfect success the heaviest kind of traffic, and that all doubts as to the possibility of transmitting a large amount of energy to a moving train by means of the trolley have been dispelled. The friends of the locomotive concede all this, but claim that the results have been obtained at a cost that is far in excess of what it would be with steam, and that, although the

experiment has been demonstrated to be an engineering success, it is a financial failure. But it is doubtful whether this is a wise view to take of the case. It must be remembered that this is the first attempt that has been made to use electricity in railroad work on such a large scale, and, furthermore, that it was undertaken by the strongest corporation engaged in the electrical industry. They, no doubt, believed that the all-important thing was to achieve a complete success in the operation of the plant; and their engineers were, in all probability, instructed to bend all their efforts in that direction without regard to cost. If an undertaking succeeds, its costliness may be explained away by a plausible argument, but, if it fails, no amount of explanation can wipe out the fact that it did not succeed. The managers of the corporation that installed the Baltimore plant are noted for their sagacity, and are as likely to realize these facts as any one. Therefore, it is safe to assume not only that the work could be duplicated at a very great reduction in cost, but also that as good results could be obtained with far less elaborate apparatus if a similar work were undertaken again. As to the cost of operation, it must also be remembered that the power station is of sufficient capacity to do four or five times the work now being done, and this without any material increase in expenses; so that if the plant were run to its full capacity, the operating expenses per train mile would be considerably reduced, and might be lower than they are with steam under the same conditions.

As the matter now stands, it is fully demonstrated that electric motors are capable of handling the heaviest kind of railroad traffic. If the future should show that they can do the work at a cost sufficiently below that of steam to render the saving in operating expenses ten or fifteen per cent, the prospects of the locomotive, at least on new roads, will be anything but bright.

Natural History Notes.

Walrus Whiskers.—A peculiar but profitable industry among the natives of Alaska is the preparation and sale of walrus whiskers for toothpicks. Nature has armed the animal with whiskers that extend three or four inches out from its snout, and the apparent use of which is to enable it to detect the presence of an iceberg before actual contact has taken place. These whiskers are quite stiff, and this quality increases with age. After a walrus has been killed, the natives, with the aid of rude pincers, proceed to pull out each separate hair. After a thorough drying, these hairs are arranged in neat packages and exported to China, where they are considered a necessary appurtenance of a Chinaman of the upper class.

Habits of the Shad.—Of the sea life of the anadromous fishes, that is, those that come from the sea and ascend rivers to spawn, and afterward return to the sea again, but little is practically known. The shad, sturgeon and salmon are examples of such fishes.

The shad that seek the Hudson, for example, come in from the ocean in the spring and pass up the river to their spawning grounds. They take no food in fresh water, and, owing to this fact, and to the exhaustion due to spawning, many of them die. Those that escape the nets of the fishermen and survive the exhaustion of nature return to sea again late in the summer or early in the fall. A few remain here through the winter, but it is comparatively very few that do so. What becomes of the shad after they go out to sea, nobody knows. They have never been met with in any great body at sea. The congregations in schools, and do this from almost the beginning of their existence; and they are supposed to remain in schools after they go to sea. But where they go, or whether they remain, each river family or school by itself, perhaps in deep water in the ocean not very far from the river whence it came, or whether the several schools meet in one vast school covering a wide territory, no one can tell.

As regards salmon, it seems certain that some of these, at least, spend their sea life not far away from their rivers, for salmon have been caught at sea in northern waters off the New England coast on hooks baited for cod, haddock and halibut.

A Shepherd Bird.—The natives of Venezuela and adjoining countries on the north side of the Amazon often avail themselves of the services of a native crane to care for their poultry, and also, in the place of collies or shepherd dogs, to herd their domestic animals. This remarkable bird, which the Indians call "yakamik," and naturalists, *Psophia crepitans*, is found in a wild state in the great forests that lie between the northern coasts of South America and the Amazon River, particularly in Venezuela and British Guiana. The birds never leave the forest unless captured. They travel in flocks of from 100 to 200. Their usual gait is a slow and stately march, but they enliven themselves from time to time by leaping into the air, executing eccentric and fantastic waltzes, and striking the most absurd and preposterous attitudes. When alarmed, they utter a peculiar cry that has obtained for them the name of "trumpeters."

These birds are very easily tamed, and prove valua-

ble servants to the natives, who domesticate them, and as they are courageous and will protect animals intrusted to their care at every risk to themselves, even dogs are obliged to yield to their authority. They may be trusted with the care of a flock of sheep or domestic fowls, and every morning will drive the ducks and chickens to their feeding place, and, carefully collecting any stragglers, bring them safely home at night. A yakamik soon learns to know and obey the voice of its master, will follow him wherever he goes, if permitted, and appears delighted at receiving his caresses. It repines at his absence and welcomes his return, and is extremely jealous of any rival. Should any cat or dog approach, it flies at it with the utmost fury, and, attacking it with wings and beak, drives it away. One quality that makes the bird valuable is its homing sense, which is perfect. However far it may wander with the flocks or herds that it guards, it never fails to find its way home at night with the animals intrusted to its care.

It is strange that several species of South American birds of different genera should share with the yakamik its instinct of guarding and taking care of domestic animals. One of these is the crested screamer (*Dicholophus cristatus*), and another the horned chauna (*Chauna chavaria*), which is often domesticated as a poultry keeper by the natives.

The Age of Trees.—The age of trees, provided these reach exceptional dimensions, is a subject upon which fancy delights to exercise itself, and there is no traveler, says the *Revue Scientifique*, to whom innkeepers, guides and stage coach guards have not narrated extraordinary things about the age of trees that were a little out of the common as regards size. From this point of view it is of interest to call attention to the conclusions of Mr. Gericke, a German forester, who asserts that the oldest trees in Germany, of which the age has been ascertained with certainty, are not more than 500 or 570 years old. It is the conifers that appear to reach the most advanced age. Among the group of trees with deciduous leaves, the oak appears to attain the greatest longevity. Mr. Gericke mentions one at Aschaffenburg 410 years of age. We know to a certainty of beeches 245 years old, of birches of from 160 to 200 years, of poplars of 220 years, of ashes of 170 years, of elms of 130 years, and of alders of 145 years. We are here far from the 500, 1,000, and 1,500 years that legend often attributes to trees; but it must not be concluded that trees of 1,500 years cannot exist. What cannot exist is the authentic proof of their age as long as they remain standing; and the estimation of their age by counting their annual rings after they are felled leaves the door open to serious errors.

Nervousness of Motormen.

The following statement of the nervous condition of men who are employed to operate some of the modern systems of transportation in the cities will be read with interest by all medical men:

Neurologists are watching with a considerable degree of interest a new expression of a nervous malady which has made itself manifest since the introduction of the Broadway cable cars and the Brooklyn trolley system. With the exception of Chicago, there are no other cities possessing anything like the street traffic of New York and where these methods of transportation are in operation. A nervous condition, not at all like the usual nervousness that is excited by great noise, confusion, or sudden danger, has developed itself in several gripmen employed on the Broadway road, and among the motormen employed on the Brooklyn trolley lines.

The constant lookout for collisions in the congested district below Canal Street, in Broadway, keeps the gripman in a state of extreme nervous tension from the time he goes on his car until he goes off. Besides keeping an eye open for visible trouble, his mind is fixed on possibilities that are under his feet. He does not know just when there is to be a pooling of interests between the grip and a broken strand in the cable, which will whisk him along the street, crashing into trucks, smashing wagons, frightening pedestrians and exasperating policemen. This continuous strain results, first, in sleeplessness, then in a falling off in appetite and extreme irritability; after this a tremor in the facial muscles. At the expiration of a week, says the *Medical Examiner*, these symptoms disappear, and may not return for ten days, but thereafter the intervals are regular and are about one week apart—seven days in a state of nervous terror and seven days in a normal, apparently healthy condition. These exhibitions apply only to men of nervous, nervo-sanguine, and bilious temperaments. While present in other temperaments, they are not pronounced.

DURING the late war Japanese surgeons are said to have employed, as a dressing for wounds, the ash of rice straw. This was freely applied after the wound had been cleansed, and sublimate gauze or linen was then superposed and held in position. The ash is said to act as a perfect antiseptic, its properties in that respect being attributed to the presence of potassium carbonate, and it is certainly the cheapest dressing on record.—*Pharm. Jour.*