That was fifteen years ago, but whenever I discover a rat hole in the establishment I administer prompt justice with chlorine and acid.'"

### Spectroscopic Notes.

Prof. H. Vogel recommends the use of a small hydrogen flame for spectroscopic work in places where there is no illuminating gas, as in the country and in some private houses. It is much hotter than alcohol, and, in fact, not inferior to the Bunsen gas burner in heat. Any form of constant generator can be employed, as the impurities in ordinary zinc and acid do not affect the spectrum. The gas is burned from a blow pipe jet, as a glass jet would yield faint spectra of the alkalies.

The same distinguished spectroscopist has also published a simple method for the detection of cobalt in the presence of nickel and iron. The three metals are converted into sulphocyanides by means of potassic sulphocyanide. Carbonate of soda is now added to the intensely red solution until the iron is all thrown down. The solution is then filtered and shaken with ether and amylic alcohol, in which the sulphocyanide of cobalt dissolves with a blue color. When nickel as well as cobalt are present the ethereal solution is greenish, but the cobalt is detected by characteristic absorption bands between C and D. In a mixture of 400 parts of ferric chloride to 1 part of cobaltic chloride, the latter was distinctly visible, as also in the presence of 200 parts of nickel. This test for cobalt is so delicate as to indicate the presence of 0·0000258 gr. of metallic cobalt to the cubic centimeter of solution. Sulphocyanide of nickel solutions give no absorption bands, and the sulphocyanide of cobalt in aqueous solution only shows a broad dark place in the green.

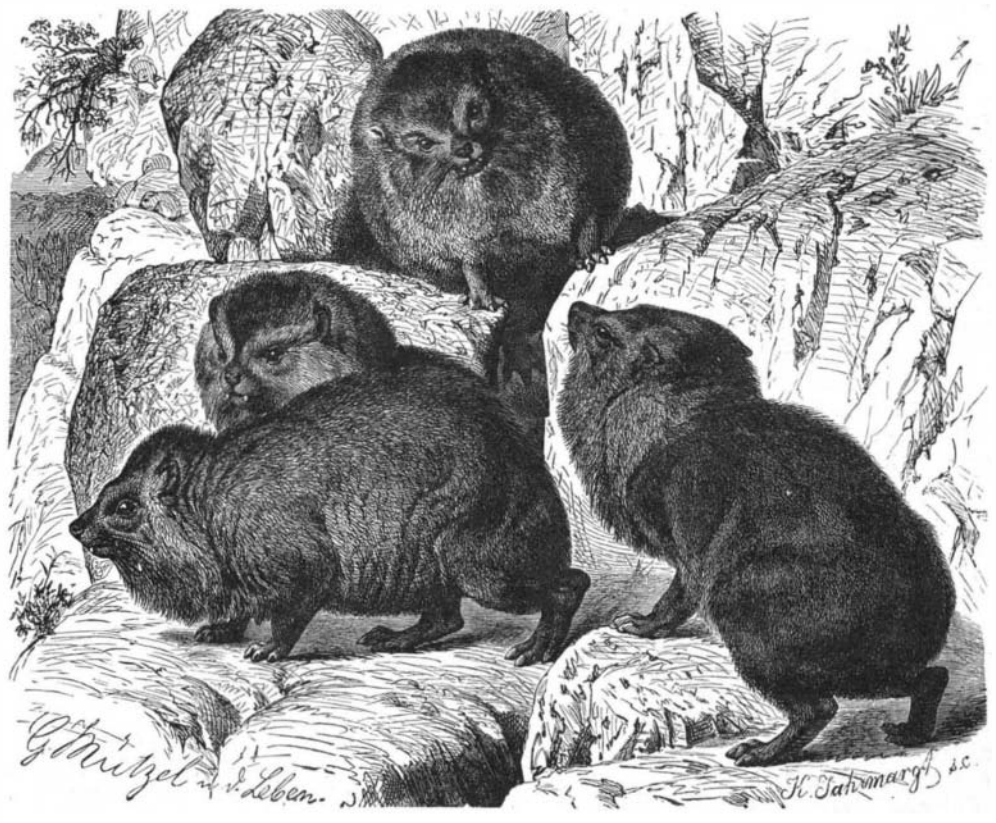
### THE HYRAX.

One of the most curious little animals in existence is the hyrax, interesting not so much from its imposing external appearance, as for its importance in filling up a link in the chain of creation.

About as large as a tolerably sized rabbit, covered with thick, soft fur, inhabiting holes in the banks, possessing incisor-like teeth, and, in fine, being a very rabbit in habits, manners, and appearance, it was long classed among the rodents, and placed among the rabbits and hares. It has, however, been discovered in later years that this little rabbit-like animal is no rodent at all, but is one of the pachydermata, and that it forms a natural transition from the rhinoceros to the hippopotamus. On a close examination of the teeth, they are seen to be wonderfully like those of the hippopotamus, their edges being beveled off in a similar manner, and therefore bearing some resemblance to the chisel-edged incisors of the rodents. There are several species of hyrax, one of which inhabits Northern Africa and Syria, while the other two are found in Abyssinia and South Africa.

The South African hyrax is termed by the colonists klip das, or rock rabbit, and is found in considerable plenty among the mountainous districts of its native land, being especially common on the sides of the Table Mountain. It is largely eaten by the natives, who succeed in killing it in spite of its extreme wariness and activity. Among the crevices and fissures in the rock the hyrax takes up its abode, and may often be seen sitting in the warm rays of the sun, or feeding with apparent carelessness on the aromatic herbage of the mountain side. It is, however, perfectly secure, in spite of its apparent negligence, for a sentinel is always on guard, ready to warn his companions by a peculiar shrill cry of the approach of danger. Sometimes the hyrax is seen at a considerable height, but is often observed near the sea shore, seated on rocks which are barely above high-water mark.

Besides mankind, the hyrax has many foes, such as the birds of prey and carnivorous quadrupeds, and is destroyed in considerable numbers. The fore feet of this animal are apparently furnished with claws like those of the rabbit, but on a closer inspection, the supposed claws are seen to be veritable hoofs, black in color, and very similar to those of the rhinoceros in form. The hyrax is an agile little creature, and can climb a ragged tree trunk with great ease. It is rather hot in its temper, and if irritated becomes highly excited, and moves its teeth and feet with remarkable activity and force.



**HYRAX.**—(*Hyrax abyssinicus.*)

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### THE PICKEREL FROG.

BY C. FEW SEISS.

The pickerel frog (*Rana palustris*, Le Conte) is the prettiest and most strongly marked of the *ranidæ* found in this section of the country. Its ground color above is pale yellowish brown, with four rows of more or less regular, squarish dark brown spots from the head to the vent. There are commonly three or four spots in each dorsal row, from behind the eye to the bend of the back (supra-iliac prominence), but in a specimen taken near Camden, N. J., these

**THE PICKEREL FROG.**—(*Rana Palustris.*)

spots are confluent, thus forming two blackish bands (see left-hand figure). This is the only specimen I ever saw thus marked, although I have frequently observed two spots to be confluent. The spots are always margined with dull grayish white. There are two glandular dorsal folds, one on each side of a yellowish or bronze color, but they are not so well defined as in the crying frog (*Rana clamitans*) or shad frog (*R. halecina*). The body beneath is yellowish-white; posterior part of thighs granulated and of a bright yellow color in life. The legs and feet are barred and spotted with dark brown. Dr. Gunther, in his "Catalogue of the Batrachia Salientia," gives as specific characters: "Body with *two* glandular folds on each side. Above *greenish*, with a row of squarish darker spots between the glandular folds." I have found generally but one fold, and where two do exist the upper cannot properly be designated as such. It also commonly runs through the row of spots, and not above it. I have never seen a "greenish" pickerel frog, either alive or in alcohol.

The pickerel frog is for the most part solitary in its habits, except during the breeding season. Although it is called *palustris* (marshy), it is found in springs and brooks more frequently than in low and extensive marshes. With the exception of the wood frog (*Rana temporaria sylvatica*), this is the most slender and active species we have. It will spring upward several feet to seize an insect on the wing.

I have noticed a peculiar way it has of showing its displeasure. Thus when I dropped an insect in the vivarium near two of these frogs, and the most active or lucky seized and swallowed it, the disappointed frog wheeled around and struck the object of his displeasure in the face and eyes with his tongue. And it is evident from the way the assaulted frog closed his eyes and moved away, that he did not relish such treatment.

We had a male of this species in our vivarium two winters ago, who would persist in creeping down and completely hiding himself under the moss at the approach of every cold spell during the winter.

The length of an adult pickerel frog, from nose to vent, is about 3 inches. It is found in the eastern United States from Maine to Virginia.

### Distribution of Plants.

BY REV. L. J. TEMPLIN, HUTCHINSON, KANSAS.

The world is full of wonders to every one who has not made up his mind to be astonished at nothing he may see. To the thoughtful mind there is much in nature to inspire wonder and admiration. The wise adaptation of means to ends, and the beautiful harmony that exists throughout all the realm of organic nature, lead the mind, free from bias, to the inference that some wise, intelligent power orders and governs all these relations and harmonies. Perhaps nowhere in nature is there a more manifest exhibition of wisdom in the adaptation of means to the accomplishment of a worthy purpose, than is seen in the various methods employed in nature for the dissemination of plants by the distribution of seeds.

In looking at this subject with an intelligent eye, the mind cannot shut out the conviction that some intelligent designer must have been employed in planning this scheme that has so much of both excellence and variety to recommend it to the judgment. To say that all this is to be attributed to chance, is to endow chance with all the attributes of a Deity, which is the very reverse of the idea intended to be conveyed by the term. In the sense intended it is perfectly absurd to attribute this or any other work to chance, for in that sense chance is nothing, and consequently can do nothing. So we regard it as the result of evolution; but I cannot see that this relieves the difficulty, even if the truth of the theory of evolution be admitted. Evolution is simply the working out of certain results under the operation of law. But what is this law? It is not correct to say that it is force, though I think many make this mistake. Law is only the established order or manner in which force operates; so that if we admit the intervention of law and a thousand or ten thousand secondary causes, still this law must have originated with a lawgiver, and behind all these secondary causes the mind must rest at last on the first cause, the author of all other causes. But I did not start out to write a moral or philosophical essay, but to call attention to some of nature's method of distributing the vegetable kingdom over the world. In producing these results we find three classes of agents at work: the waters, the winds, and animals, besides certain arrangements within the plants themselves for the accomplishment of this purpose. And we find the seeds themselves adapted to these different means of transportation. The light character of many seeds well adapts them to floating from place to place, while their impervious coverings protect them while being carried long distances by the currents of the ocean or of rivers, and then when they lodge on some island or other shore they readily spring up and grow. What, for instance, can be better adapted to floating from island to island than the tough, corky covering of the cocoanut? The seeds of grasses and other plants are washed down from the higher grounds by streams, and they are thus widely distributed.

The seeds of many plants, as of the dandelion, thistle, and a long list of similar plants, are furnished with a tuft of downy or silky pappus, that will enable them, when ripe, to float away on the breeze and thus be scattered far and wide. The seeds of some species of poplar, as cottonwood, are attached to a bunch of fine cotton that serves as a buoy to bear them up through the air, by means of which they are frequently carried many miles from the parent tree. Seeds are often disseminated through animal agency. Animals frequently carry seeds and nuts away and bury them for winter food, where they are forgotten and left to grow.

Many seeds of fruits are swallowed by birds and carried to distant places and voided uninjured, and there spring up and grow. Thus the seeds of cherries, grapes, gooseberries, blackberries, and many others of like nature, are sown broadcast over a large extent of country. During an invasion of the Rocky Mountain locusts into Iowa a few years ago, they left the ground where they fed thickly strewn with the seeds of some species of grass, new to that locality,

which they had brought from the far Northwest. Many seeds are provided with hooked barbs, by which they cling to clothing and the coats of animals, and are carried about from placeto place.

Many people are familiar with the cockle burr, the Spanish needle, the "beggar lice," and burdock, and how tenaciously they adhere to any surface where they can get a hold. To this we may add the sand burr (*Cenchrus tribuloides*), with its sharp spines, one of the most execrable weeds I have made the acquaintance of. Some seeds, as of the maple, ash, elm, etc., are furnished with a wing that causes them to sail off some distance in falling. The locust, Judas tree, or redbud, and others, have a light pad that will often sail off to a considerable distance, thus scattering their seeds.

Some kinds of bean have the pod so arranged that when it bursts it suddenly twists into a coil, throwing the seeds a considerable distance. This habit in the *Impatiens*, or touch-me-not, geranium, etc., is well known. The squirting cucumber (*Momordica elaterium*), when ripe, bursts with a considerable report, throwing its seeds many feet.

A few plants, when their seeds are ripe, travel over the country and sow them themselves. A good example of this kind is the "tumble weed," about the true name of which the doctors disagree. Two species grow here; the larger, which is the tumble weed here, grows in a thick cluster of very slender branches, and these so numerous that the bunch, which is often as big as a hogshead, can scarcely be seen through. When ripe they are torn from the roots by the wind, and then they roll and tumble, often with the speed of a racehorse, till they meet an obstruction that they cannot surmount, and there they rest till the wind changes, and then they start again; and this is kept up till they are worn out and broken to pieces. Their seeds are thus scattered over all the country.

A plant that grows on the deserts of Africa, the rose of Jericho (*Anastatica heirochuntica*), when ripe, curls into a ball, becomes detached from the soil, and rolls about before the wind till a light shower of rain falls, when it opens its seed pods and drops its seeds, which germinate in about eighteen hours. The wisdom of the arrangement here is seen when we remember that if it remained where it grew the whole plant would probably be covered by the drifting sands, and that if its seeds did not germinate quickly, while the transient moisture lasted, they never could grow at all. Thus does nature care for her children.—*Gardener's Monthly.*

### Cinchona Culture for the Pacific Coast.

Mr. Willis Weaver, of Bogota, South America, has written a long letter to the Department of Agriculture advocating the introduction of the cinchona tree in California.

After reviewing the conditions under which the cinchona tree thrives naturally in South America, and, under cultivation, in India, Mr. Weaver says: "The cinchona seems to seek a dry soil, but a climate affording plenty of rain in certain parts of the year. The coasts of Northern California and Oregon would fulfill the conditions as to moisture; the slopes of the mountains would probably furnish hilly ground very similar to that occupied by the tree in its native habitat; while I believe that the temperature would admit of its cultivation even north of the mouth of the Columbia. It is also uncertain as to how far any undue dryness of the atmosphere may be overcome by irrigation. The surprising results already attained in the cultivation of the trees prepare us to expect further advances, and this may be one of them as naturally as anything else.

It is well known that the barks produced under cultivation are much superior to the natural bark, as the process of mossing the tree causes a remarkable development of the alkaloids in which their virtue consists. Also that the cultivated trees are not destroyed. A strip is taken off reaching the length of the trunk and one-third its circumference. The wound is then dressed with straw matting and kept wet until the bark forms anew. The next year another strip is taken, and so on, indefinitely. I am told that the harvest begins when the tree is five years old, but am not in a position to verify the statement.

"I have calculated roughly, according to the prices of land and labor here, that a plantation of a hundred acres might be put in at less than $1,000 an acre, covering all outlay—or say $1,500 to cover interest and all contingencies."

A yield of $8,000 an acre has been reported from Indian plantations. Mr. Weaver is convinced that with a wise choice of sites and judicious treatment, together with a careful selection of the proper varieties, the cinchona tree could be cultivated in many parts of the Pacific coast, and probably in New Mexico; that if irrigation can be made to supply the place of a naturally moist climate, the cultivation can be carried into a large part of the Colorado Valley and Texas, as well as into Northern Georgia and Alabama, and thence north along the southern slope of the Blue Ridge. He would not be surprised if the hardier varieties were found to grow even in Virginia and Colorado and in Arkansas, in favored situations on the southern slopes of the Ozark mountains.

### Non-Inflammable Wood.

At a meeting of the British Association recently held at Sheffield, Col. P. P. De la Sala exhibited non-inflammable wood for building purposes, also wood shavings, non-inflammable, for the manufacture of mats, rope, etc. The inventor thus explains his peculiar method, which is already patented:

"Though all alkaline compounds reveal the property of rendering vegetable matter more or less pliable and non-inflammable, I preferably make use of carbonates of fixed alkalies in the following way: I dissolve in cold or warm clear water carbonates of potash or soda, or I make use of them in a solution of filtered water heated to the boiling point, and add hydrate of lime to this solution, graduating the strength so as not to exceed a specific gravity of 1·060 if potash is used, or 1·050 when soda is used. In the first case, the strength of the solution corresponds to about 30 grains of hydrate of potash to the fluid ounce, or about 20 grains of hydrate of soda to the fluid ounce. Wood to be used in naval construction, and in buildings or structures of wood on land, as well as vessels and land buildings already constructed, can be rendered fireproof by saturating the floors and decks, and all exposed woodwork, with alkaline lyes, and when dry, the wood may be whitewashed, painted, or varnished in the usual way.

"For boards, planks, or thicker pieces of timber, I graduate the time of immersion so as to form a coating of from one-sixteenth to one-eighth of an inch, which can be obtained in from four to twelve hours, according to the more or less porous nature of the wood, or the compactness of its fiber. I consider a coating of about one-eighth inch deep to be a sufficient fire protection for all kinds of timber for building purposes, as the spread of fire and great conflagrations generally originate in relatively small causes, such as burning cinders, dropped sparks from fireplaces, matches accidentally ignited, inflamed liquids, candles left burning, etc.; but the fireproof coating can be made deeper, or even to go through the whole timber, in the event of its being considered desirable to combine great flexibility with absolute non-inflammability. In this case I make use of hydraulic or other pressure, so as to force the alkaline lyes through the wood to the extent desired."

A comparison is yet to be made between this method and others as to relative cost of the flame prevention. *Per se*, any method of treatment whose cost exceeds that of fire destruction in a given case, is practically inapplicable.

### The American Missionaries in Turkey.

A special correspondent of the London *Times*, in a recent letter to that journal from Turkey, dated at Aintab, Dec. 25, 1879, pays the following high tribute to the value and influence of American missionaries in that empire:

In a former letter I promised to give some account of the work of the American missionaries in Asia Minor, and I the more readily hasten to fulfill that promise, as the work of those missionaries is not without interest and importance in respect to the political future of the country. Not that the missionaries have interfered or are likely to interfere directly in political affairs, but it seems more and more evident from year to year that the institutions established by the missionaries are having a positive effect in making men acquainted with their natural rights, and also in showing to the native populations of the country that self-reliance and self-exertion are the only roads to happiness and prosperity. The statistics of the various missions in Asia Minor for the past year have been furnished me in advance of publication. As I turn them over I confess to a feeling of considerable embarrassment at attempting to compress the statistics, with needed explanations, into a single letter. If this is found impossible, I shall crave your indulgence for supplementary statements in a subsequent letter.

The first American missionary arrived at Constantinople in 1831; as the operations of the Americans have continued from that date to the present time without interruption, they extend over a period of 49 years. Much time was spent at first in exploring the country, mastering the languages of the people, becoming acquainted with their manners and customs, and in attempts, often unsuccessful, to overcome the prejudices and fanaticisms of those who looked with suspicion on the arrival of these strangers from a distant land.

As soon as possible after their arrival the missionaries began to work through the press, and they have gone on steadily through this department until the business of translating, publishing, and circulating their books and newspapers has reached large proportions—large at least for a semi-civilized country like Turkey. As no one language is used by all the races of Asiatic and European Turkey, it has been necessary to prepare books in several different languages—thus, for example, the Bible has been translated into the Arabic, Armenian, Turkish, Bulgarian, and Hebrew-Spanish languages, while editions have also been issued in Armeno-Turkish and Greco-Turkish, and portions of the Bible also in Kurdish. As might be expected, a large proportion of the books published by the missionaries are on religious and moral topics; yet there are many works on other subjects; in the list before me I find arithmetics, geographies, grammars, histories, works on mental philosophy, on teaching, algebras, geometries, a compendium of physiology, and other works of a similar kind. The history of the Reformation in the sixteenth century is given in several compact volumes. One solid octavo of several hundred pages is devoted to church history. From the report of the publication department for the past year I find that the missionaries have issued in the Armenian language during that year 19,175 copies of different works, amounting to 2,122,500 pages; in the Armeno-Turkish language, 23,300 copies, amounting to 1,524,200 pages; in the Greco-Turkish, 3,810 copies, consisting of 287,760 pages; and in the Bulgarian language, 14,915 copies, in 2,462,620 pages; or a total in the past years of 61,200 copies, in 6,397,000 pages. The same report states that the entire number of copies issued from the mission presses from the beginning amounts to 2,248,354, and the whole number of pages issued in the native languages of Asiatic and European Turkey amounts to 325,503,988. The expenditure in the publication department during the past year amounted to 388,510 piastres (T£=100), or about £3,500 sterling. Among the most useful and popular of the publications of the missionaries are several newspapers, partly religious and partly secular; these are published in the Bulgarian, Armenian, Armeno-Turkish, and Greco-Turkish languages. As the editors of these papers, during a long series of years, have taken much pains to furnish only the most reliable information to their readers, the papers have an established character for accuracy, which is not enjoyed by great numbers of sensational publications in the Levant. In this brief summary of what the Americans are doing in Turkey through the press, I have omitted entirely the operations of the missionaries in Syria and Egypt. As is well known, those operations are on an extended scale, but they are rather outside of the region to which this letter relates.

The missionaries attach great importance to the organization of native congregations and churches. These congregations are presided over by native preachers and pastors. The churches manage their own affairs, and support their pastors so far as possible, and, to a large extent, their own common and high schools. The missionaries, in dealing with the native congregations, act uniformly on the principle of helping only those who help themselves. The result has been that throughout the country are found many communities of intelligent men who are making continued and earnest efforts to sustain the institutions that have been founded by the missionaries. In many cases these communities are what are called self-supporting—that is, they draw nothing from foreign sources toward the expenses of their own schools, churches, and congregations. In all cases a large percentage of the expenses incurred are borne by the people, the proportion depending upon the size and ability of each congregation. Some idea of the number and importance of these congregations may be obtained from the following statistics. These statistics relate only to three missions in Asia Minor, and which are known as the Western, Eastern, and Central Turkey Missions. They do not include the reports from European Turkey and from Syria and Egypt:

The whole number of registered Protestants in Asia Minor is 24,975. These are formed into a separate civil community, having a chief or headman at Constantinople. The number of separate congregations of Protestants is 225; these are found in all the large cities and in many of the towns and villages that are scattered through the country, from the Black Sea to the Mediterranean, and from Constantinople to the borders of Persia. The total number of educated native pastors and preachers is 116, while the whole number of school teachers is 312. Quite a number of the native preachers, as well as some of the teachers in the high schools and colleges, are men of marked ability. The number of common schools is 283, and the whole number of scholars in these schools is 9,621. The branches taught in the common schools are reading, writing, spelling, arithmetic, geography, grammar, and sometimes algebra, physiology, and English. Great attention is given to the organization and management of Sabbath schools. The object of such schools is the simple study of the Christian Scriptures. The number of such schools is reported at 176, with an average attendance of 15,423 persons. Men, women, and children attend the Sabbath schools, and engage for an hour and a half each Sabbath in the earnest study of the Bible, aided by competent teachers, and under the general direction of the native pastors. That the native people are really in earnest in this work appears from the contributions which they make for its support. Very few men of wealth have joined the Protestants, while the great majority of the members of that community are men from the humbler classes of society—men who, under the accumulated burdens imposed upon them by the Turkish Government, find it very difficult to support themselvs and their families. Yet these laboring men gave during the past year, for the support of their own churches, schools, and other objects, 468,247 pias. (T£=100), or £4,214 sterling. The missionaries feel, doubtless with good reason, that this is one of the most encouraging items in their annual budget, not that the amount, in itself considered, is large, but because it is the best possible evidence of the sincerity and zeal of those who have joined the Protestant communities. One of the most encouraging results of the work of the missionaries in Asiatic Turkey is seen in the demand for schools, seminaries, and colleges of a high grade; this demand is not confined to either sex, nor to any particular people. To meet this demand boarding schools for girls, and high schools, colleges, and theological seminaries for young men, have been established at many important centers in Asia Minor. These institutions are all under the immediate control of the missionaries themselves, assisted in every case by competent native professors and teachers.

A detailed account of these educational institutions would lead me too far from the purpose of this letter, yet I may mention, as examples of what the Americans are doing in this respect, the girls' boarding schools at Marsovan, Brusa, Bitlis, Mardin, Kharpoot, and Aintab, the theological seminaries at Marash, Kharpoot, and Mardin, and the two colleges recently established at Aintab and Kharpoot. As these institutions are at central points, and as they are already exerting very considerable influence in the country, those who wish to obtain more complete information in regard to the

missionary work in Asiatic Turkey would do well to put themselves in communication with the missionaries in charge of them. Robert College at Constantinople, and the Syrian Protestant College at Beyrout, are too well known to the British public to require special notice at my hands. It gives me pleasure, however, to report in regard to both of those deservedly popular institutions that their prospects were never so full of hope as at the present time.

### Still another Chemical Photometer.

There are several metals like uranium which are more or less sensitive to light when mixed with organic matter. The high degree to which silver possesses this character is well known. Dr. Eder, in Vienna, has studied the action of light on corrosive sublimate (mercuric chloride), and finds that it is easily reduced to calomel (mercurous chloride) in the sunlight. As the former substance is soluble in water and the latter is not, a white precipitate shows the change. It was found that the following proportions were the most sensitive: Dissolve 40 grammes of oxalate of ammonia in 1 liter of water (4 per cent) and 50 grammes corrosive sublimate (5 per cent) in 1 liter of water. Mix together 2 volumes of the former and 1 of the latter. In the red, yellow, and yellowish-green portions of the spectrum the solution remains clear, but is rapidly precipitated in the blue, violet, and ultra violet. The weight of the precipitate per minute is proportional to the photometric strength of the light.

### The Largest of Land Animals.

In the *American Journal of Science and Arts*, Prof. Marsh describes the largest land animal yet known to have existed on the globe. Its name is *Atlantosaurus immanis*. The thigh bone of this creature is over 8 feet long, with a thickness at the larger end of 25 inches, though the bone has no true head. A comparison of this bone with the femur of a crocodile would indicate that the fossil saurian, if of similar proportions, had a total length of 115 feet. That the reptile was 100 feet long when alive is at least probable. The other bones of this animal that have been found are proportionately gigantic; caudal vertebra has a transverse diameter of more than 16 inches. All the bones of this reptile yet discovered are in the Yale College Museum. They are from the Upper Jurassic of Colorado.

### A Fish Story.

A Boston correspondent of the *Forest and Stream* tells the following remarkable story. The scene is laid in Long Island, where, on the shore of a pond, the correspondent was watching the play of swallows as they skimmed just over the surface of the water shortly before sunset. "About a hundred yards out was a bed of lily pads; and as the swallows skipped it, occasionally a good sized ripple could be seen, and sometimes a break from the edges indicating a fish there. This fastened my attention to the particular place. I had often seen cats play with swallows, swooping at them, but the idea of fish doing the same was something new to me. Presently I saw a clean breach, and a fine large pickerel showed his whole size and got a swallow, too, as he disappeared beneath the water. This I saw repeated several times, and I called the attention of my companion to this novel sight. While we were watching we saw two large fish break at the same swallow, the fish coming from opposite directions, and each head on to each. Both missed the swallow, but, singular to relate, only one fish was seen to fall into the water, and neither was seen to pass the other. My companion and myself looked with wonder. There was a great commotion in the water with a continuous spattering, and a boat being handy we jumped in and rowed to the spot, and picked up the largest pond pickerel I ever saw. When we had him in the boat the mystery was solved; the smaller of the fish had, in his eagerness for the swallow, jumped clear down the larger one's throat, and only the tail, to the extent of about an inch, showed. The large fish was completely rent asunder and killed by the catastrophe. Both together weighed 22 pounds."

Two telephone companies have been chartered in Paris by the government, and are now connecting their central offices with the residences and offices of the subscribers. The company using the Edison telephone charge six hundred francs a year. The Société Générale de Telephones uses the Gower telephone, and charges one thousand francs per year. The government reserves the privilege of buying out both companies.

### ELECTRICAL RAILWAY.

The electric railway illustrated in the accompanying engravings, which we take from *La Nature*, was exhibited at the Berlin Exhibition of 1879. It presents a good example of the conversion of motive force into electricity and the conversion of the electric current back into motive force.

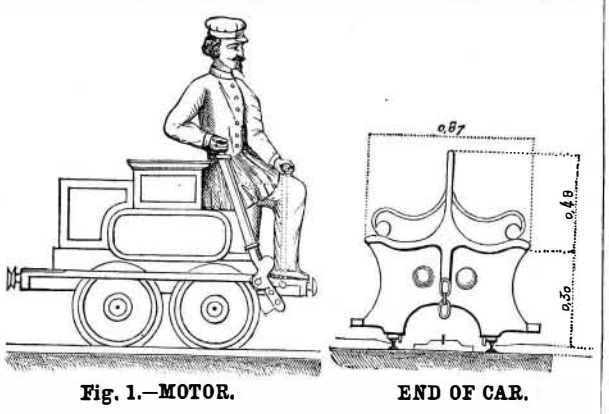


Fig. 1.—MOTOR. END OF CAR.

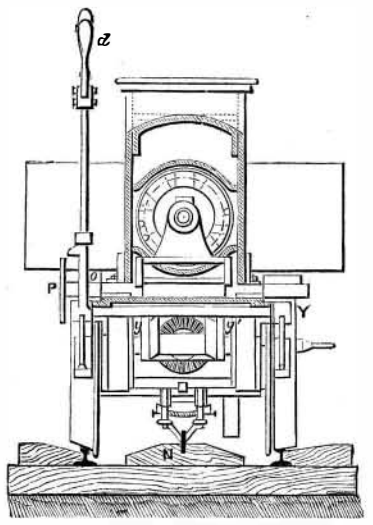


Fig. 2.—END VIEW OF MOTOR.

Two magnets or dynamo-electric machines, A and B, connected by metallic conductors, form a complete system for the transmission of power. If motion is imparted to the machine, A, an electric current will be produced which is converted into motive power by the machine, B. Of course the machine, B, delivers only a part of the power applied to the machine, A, and this amount of power transmitted varies with the nature of the machines, their speed, and the length of the conductors connecting them. Some machines are capable of delivering 60 per cent of the original power under favorable circumstances. A dynamo-electric machine operated by a steam engine, and connected by conductors with a second dynamo-electric machine mounted on a vehicle, the wheels of which are acted on by the second machine, constitutes an electric carriage or wagon. If the vehicle be placed upon rails, and the rails are used as conductors, the current being taken from an insulated rail by a metallic brush and returned to the electric generator by the ordinary uninsulated rails, we have an electric locomotive; connect a few cars with this locomotive and we have the electric railway as constructed by Dr. Werner Siemens, the well known German electrician, and exhibited at Berlin.

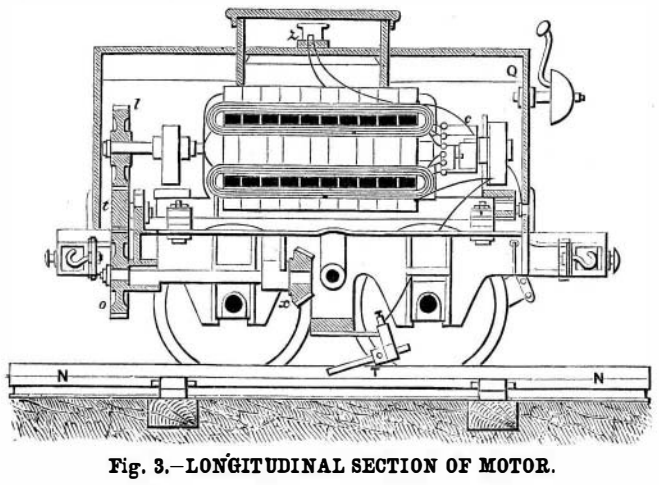


Fig. 3.—LONGITUDINAL SECTION OF MOTOR.

In the annexed cuts Fig. 1 represents a side view of the locomotive and a cross section of the cars, both drawn to a scale of $\frac{1}{10}$. Figs. 2 and 3 show detailed views of the locomotive on a scale of $\frac{1}{5}$. Fig. 4 shows the locomotive drawing three cars, each containing six passengers. The machines used are of the continuous current system of Siemens. The armature is rotated by means of the current received through the conductors from the stationary machine, and transmits its motion to the driving wheels through a number of gear wheels, *l, t, v, x, y*, which are necessary to reduce the speed.

The machine producing the current has one of its poles connected with the track rails, and the other pole is connected with the insulated central rail, N (Figs. 2 and 3), which is simply a conductor. A pair of brushes made of very fine copper wire, like the collectors of the Gramme machine, are kept in contact with the rail, N, completing the electrical communication between the rail and the machine. The current comes through the insulated rail, passes through the brushes, traverses the wires of the electric motor, and returns through the wheels and track rails.

The cars and the locomotive have an electrical connection through a copper wire. The sixteen wheels of the train form a perfect metallic communication between the locomotive and the rails for the return current.

The locomotive is started and stopped by a lever controlled by the driver sitting on the locomotive. The brake is operated in a similar way. The performance of the locomotive varies from 2 H. P. and a velocity of 6 feet per second, to 3½ H. P. and 12½ feet per second (7$\frac{9}{10}$ miles per hour), the train carrying eighteen passengers.

Fig. 4.—SIEMENS' ELECTRICAL RAILWAY.

### MECHANICAL INVENTIONS.

Mr. Alfred H. Crockford, of Newark, N. J., has patented an improved brace for bits and drills of all kinds, whereby the bits and drills may be centered and firmly secured in the brace. The bits can also be readily applied to work in places or positions where the brace stock cannot have full swing.

An improved paper machine has been patented by Mr. William E. Phelps, of Lewisville, Pa. The object of this invention is to strengthen the paper by laying the fibers in all directions, instead of in the direction of the length of the paper only, as is now done.

Mr. Elijah Ware, of Omaha, Neb., has patented an improved spring power for watches and clocks. The object of this invention is to construct a spring power mechanical movement for use in watches and clocks, or for other purposes, where a small power is required, and to dispense with the train of gearing usually required. The inventor makes use of a spring attached to and coiled around a shaft that carries a loose and fast gear wheel, the spring being attached also to the loose gear, and the two wheels geared to a secondary shaft.

Mr. James A. Moore, of Kewanna, Ind., has invented a spring-propelled carriage, whose motive power is contained in a combination of coiled springs, levers, eccentrics, etc. These are so arranged upon a carriage as to be capable of exerting sufficient force after the springs are wound up to effect a long continued and economical propulsion of the carriage.

Improvements in pressing machines for printers, bookbinders, etc., have been patented by Mr. Joshua W. Jones, of Harrisburg, Pa. The object of this invention is to improve the construction of the machines for which letters patent Nos. 204,741 and 212,947 were granted to the same inventor June 11, 1878, and March 4, 1879, respectively, and which were illustrated in these columns some time since.

Mr. Ebenezer R. Gay, of Dubuque, Iowa, has patented a