LYNX IN THE BERLIN ZOOLOGICAL GARDEN.

The Egyptian lynx (*Lynx chaus*) in the Berlin Zoological Garden, from which the accompanying illustration was drawn, is about the size of a wildcat. The color of its rich fur is pale gray, with a shimmer of brown, but without any decided ground color; the cause of this peculiarity being the marking of the separate hairs, which are yellow at the root, have a black ring in the middle and have white, gray or black tips. His head is like that of a large cat, and his ears, which are grayish yellow on the outside and reddish on the inside, bear the characteristic mark of the lynx, little brush-shaped tufts of hair; the jaw and teeth are very strong.

The *Lynx chaus* inhabits most parts of Africa and Southern and Western Asia, but is found chiefly in the countries bordering the Caspian Sea, Persia, Syria, Nubia, and Egypt; in the last of which it is often hunted. Modern explorers and tourists in Egypt seldom miss a hunt for this game. The lynx is one of the animals which, thousands of years ago, were embalmed and buried in sacred places by the Egyptians. Brehm writes of the swamp lynx: "He is no rarity in Egypt, but is not often seen. In those countries there are no large forests in which a beast of prey can conceal himself, and therefore it is necessary for him to find other hiding places. The hyena usually has its den in the clefts of the wilderness, but often lives for a long time in a reed bed, the jackal and fox hide in reed grass or grain, and the lynx also lives quietly in similar places. His favorite haunts are the Nile-watered grain fields, but he also inhabits the great plains, which are more or less thickly covered with tall, sharp reed grass (*Poa cynosuroides*). Like all wild cats, the lynx creates great havoc among the birds; he also catches rats, mice, and young hares, but his principal food consists of the members of the feathered world, which he kills without regard to the beauty of their plumage, or other good qualities. He creeps noiselessly upon his prey, and often springs into the air to catch it. He steals doves and fowls from farmyards and, consequently, is feared and hated by the fellahs. Young lynxes have been tamed.—*Illustrirte Zeitung*.

LYNX IN THE BERLIN ZOOLOGICAL GARDEN.

THE EIFFEL TOWER.

We give herewith an engraving of this great work, for which we are indebted to *L'Illustration*, and from *Engineering* we gather the following particulars:

The Eiffel Tower is the natural development of the class of work upon which its constructor has been occupied for so many years; it was the direct outcome of a series of investigations undertaken by M. Eiffel in 1885, with a view of ascertaining the extreme limits to which the metallic piers of viaducts could be pushed with safety, this special line of investigation having reference to a proposed bridge with piers 400 ft. in height and 140 ft. of base. The idea of the great tower followed, preliminary plans were prepared, and calculations made by two of M. Eiffel's principal engineers, MM. Nouguier and Koechlin, and by M. Sauvestre, architect. Naturally the leading principle followed was that adopted by M. Eiffel in all his lofty structures, namely, to give to the angles of the tower such a curve that it should be capable of resisting the transverse effects of wind pressures without necessitating the connection of the members forming these angles, by diagonal bracing. The Eiffel Tower, therefore, consists essentially of a pyramid composed of four great curved columns, independent of each other, and connected together only by belts of girders at the different stories, until the columns unite toward the top of the tower, where they are connected by ordinary bracing. Iron, and not steel, was used in the construction throughout.

There are four independent foundations, each standing at one angle of a square, about 330 feet on a side; the two piers nearest the Seine were known as numbers 1 and 4, those adjoining the Champ de Mars as 2 and 3. On the site of the two foundations 2 and 3, the bed of gravel was met with 23 ft. below the surface; the thickness at this point is about 18 ft. The conditions for obtaining a good foundation were therefore extremely favorable, and the piers were built upon a bed of cement concrete 7 ft. in thickness. The two piers nearest the Seine required different treatment. The bed of sand and gravel was only met with about 40 ft. below the surface, that is to say, about 16 ft. lower than the mean water level of the Seine, and it was overlaid by soft and permeable deposits. Excavations were pushed, by means of caissons and compressed air, to a depth of about 52 ft. below the surface, and it was found that, under the gravel, variable deposits of fine sand, formed of limestone and sandstone, had accumulated, having been left there by the stream. Owing to this there existed a good and incompressible bed about 10 ft. thick under the western pier on the Grenelle side, and nearly 20 ft. thick under the north pier on the Paris side. Apart, therefore, from the difficulties in sinking for the foundations, the conditions were very satisfactory. The mode of sinking adopted was that of compressed air, with iron caissons 49 ft. 2 in. long by 19 ft. 8 in. wide; four such caissons were required for each pier, and they were sunk to a depth of 40 ft. below the surface, or 16 ft. lower than the Seine mean water level.

The tower terminates at a height of 896 feet above the ground, with a platform about 53 feet square. The width of the column at this level is 33 feet, the gallery being carried by brackets which are sufficiently wide to afford a considerable area of platform. It is almost unnecessary to state that this space is securely protected by a railing and glass to prevent any voluntary or involuntary catastrophe. Above the platform rises the campanile, which is of the design shown; in the lower part of this is established a spacious and very completely fitted laboratory, closed to the public and intended for the prosecution of scientific research and observation. Four latticed arched girders rise diagonally from each corner of the lower part of the campanile and unite at a height of about 54 feet above the platform. By means of a spiral staircase yet another gallery is reached, about 19 feet in diameter, and surrounding the lantern which crowns the edifice and brings the height of the structure to 984 feet. Above this rises the great lightning conductor. Within the lantern, which is 22 feet high, will be placed a very powerful electric light, placed within a lantern of the first order, and projecting white, blue, and red beams. Reflectors will throw these beams over Paris, and will help to illuminate the Champ de Mars.

Provision is made for protecting the structure from the effect of lightning by means of cast iron pipes, 19 inches in diameter, and passing through the water-bearing strata below the level of the Seine for a distance of 60 feet. At one end these pipes are turned vertically, and are connected with the ironwork of the tower. There are eight pipes in all, two for each column.

The total weight of wrought and cast iron that has been used in this unique structure is 7,300 tons, not including the weight of the caissons employed in the foundations nor the machinery installed for working the elevators.

No doubt during the period that the exhibition is kept open the ample facilities thus provided for the public will not be found excessive, but it is scarcely reasonable to suppose that after all the buildings on the Champ de Mars have been swept away, and the vast column alone remains to suggest the glories of the departed centennial celebration, great numbers of visitors will go so far out of Paris as the Champ de Mars to enjoy a sensation which by that time will have ceased to be novel. It is to be hoped that, by the time the exhibition closes, the enterprising syndicate which has acquired the Eiffel Tower will find themselves repaid to a large extent. Otherwise there is reason to fear that their speculation may not turn out profitable, and that their twenty years' concession will scarcely suffice to make their speculation a satisfactory one.

But of course the tower has other uses than that of money making, some uses which are now apparent, and others which the existence of the structure will suggest as time goes on.

We may conclude this notice with a few miscellaneous particulars of this interesting work. The total weight of iron employed in the structure itself is 7,300 tons. The weight of rivets is 450 tons, and their total number 2,500,000. Of this quantity 800,000 were riveted up by hand on the tower itself, during the work of fixing together the finished pieces which had been completed at M. Eiffel's establishment at Levallois-Perret, and which were delivered on the Champ de Mars ready for erection. The number of pieces of iron of different forms is 12,000, and each of these required a special drawing; there were thus no less than 12,000 working drawings sent into the workshop, to say nothing of the innumerable sketches and plans prepared before the final details were decided upon. The total thrust upon the foundations is 565 tons, not including the effect of wind, and 875 tons under a maximum wind pressure. The tower is painted of a rich chocolate color, the tone of which is lightened from the base toward the summit. The painting, which was of itself a considerable work, is very effective, especially when lighted by the sun. But little decoration has been attempted; it would have been wasted labor and expense. The level of the first story is marked by a bold frieze, on the panels of which, around all four faces of the tower, are inscribed in gigantic letters of gold the names of the famous Frenchmen of the century who have most contributed to the advancement of science.

"It is as it were under their patronage that this monument is erected, and the constructor has desired to consecrate to them the place of honor, and upon it to write their names in letters of gold, as an evidence of public recognition, and as of homage paid to their efforts, without which such an enterprise could never have been attempted."

Above this frieze the four-sided arcade, covering the exterior gallery, is elaborately decorated, and considerable exception has been taken to this feature as marring the bold and graceful outline of the tower. A similar arcade encircles the tower at the level of the second story, and the same objection may be raised with regard to it, but with less force, because the great height makes the arcade look insignificant. The sloping arches and spandrel fillings which connect the columns of the tower on the four faces beneath the first story are singularly well adapted to the gigantic scale of the work.

Very careful observations were made from time to time as the erection of the tower advanced to check its verticality. These observations showed conclusively that the foundations had not yielded at all under their very moderate load, and that if any deviation from the vertical existed, it was so slight as to be scarcely appreciable with the most careful measurement. All the other calculations of M. Eiffel have been so complete and accurate, and his experience with high structures so exceptional, that his assurance may be taken with confidence that the oscillations of the tower at the summit under the most unfavorable conditions of wind pressure will not exceed 6 inches, while the periods of vibration will be relatively slow. Under ordinary conditions of weather the tower will remain absolutely rigid.

The success of the many problems attending the erection of the tower has been complete, and does M. Eiffel much honor.

The remarkable regularity with which this erection has been accomplished, and the fact that no correction of any kind was ever required, is an ample proof of the precision with which the innumerable parts that compose the structure were turned out from the ateliers of Levallois-Perret. This achievement also shows how well the arrangements for the erection were combined, all having come to pass as had been foreseen, without error, without accident, and without delay.

To obtain such a result, M. Eiffel has been admirably seconded by MM. Nouguier and Koechlin. M. Nouguier, who is chief engineer to the Eiffel firm, had the entire management of the erection of the famous bridge over the Douro (Portugal). He and his colleague, M. Koechlin, are well known for their entire competence in matters regarding iron structures, and have for twelve years taken an active part in all the works achieved by M. Eiffel.

Horse Power and Sails on Early Railways.

According to *Engineering News*, a correspondent of the Washington *Star* has been ransacking the national museum for some of the earlier motors on railways, the experiments of a period when the steam locomotive was still looked upon with doubt and distrust. He says that in 1829 a Mr. C. E. Detmold contrived, for use on a South Carolina railway, a car propelled by an endless chain attachment worked by a horse, treadmill fashion. This car, the "Flying Dutchman," ran on this road for some time and attained a speed of 12 miles per hour. A similar expedient had been previously tried on the Baltimore & Ohio Railroad; but as it worked indifferently well, and on one occasion ran into a cow and dumped a lot of editors into the ditch, the press of that region was unanimous in pronouncing the experiment a practical failure.

After the horse experiment, the Baltimore & Ohio road next had recourse to the wind as a motor, and a sailing car, known as the "Meteor," was invented by Evan Thomas, and ran for some time "whenever the wind was favorable." This car made good time with the wind abaft or on the quarter, but with the wind abeam it would capsize at times, and no wind at all caused some provoking delays. The Charleston *Courier* of March 20, 1830, describes as follows an experiment with a sailing car on the South Carolina Railway:

"A sail was set on a car on our railroad yesterday afternoon in the presence of a large concourse of spectators. Fifteen gentlemen got on board and flew off at the rate of 12 to 14 miles an hour. Thirteen persons and three tons of iron were carried about 10 miles an hour. The preparations for sailing were very hastily got up, and of course were not of the best kind, but owing to this circumstance the experiment afforded high sport. The wind blew very fresh from about northeast, which, as a sailor would say, was "abeam," and would drive the car either way with equal speed. When going at the rate of about 12 miles an hour and loaded with fifteen passengers, the mast went by the board, with the sail and rigging attached, carrying with them several of the crew. The wreck was descried by several friendly shipmasters, who kindly rendered assistance in rigging a jury mast, and the car was again put under way. During the afternoon the wind changed so as to bring it nearly ahead when going in one direction, but this did not stop the sport, as it was ascertained that the car would sail within four points of the wind. We understand it is intended by some of our seamen to rig a car properly, and shortly to exhibit their skill in managing a vessel on land."

Sail cars have been used on the level roads of Holland, Spain, and China. C. J. Bascom, of the Kansas Pacific road, constructed a car with a mast 11 feet high, having a triangular sail with two booms. With a favorable wind it would speed over the plains at the rate of 40 miles an hour. At Barnegat beach railroad men frequently hoist a sail on construction cars and take advantage of the wind. On the Maiden Island, in the South Pacific, a tramway 5 miles in length, constructed for the purpose of bringing guano from the guano fields to the harbor, is operated by sail power and by hand. The trucks are pushed up to windward, loaded, and then sail is made and the train moves along at a fine rate. On these islands there is nearly always a fair wind. The locomotive truck carries a single mast in its center, rigged with a large sail.

Vesuvius in Eruption.

Recently Vesuvius has been more active than usual. Numerous convulsions in the interior resulted in the rending and then the collapse of the last new cone at the top of the mountain. "We are so used," the Naples correspondent of the London *Daily News* says, "to these changes at the extreme summit that it is no new thing to see from Naples that the point of the active crater has fallen in, and the top of the mountain has been reduced to the flatter shape which is its normal form. On this occasion, a stream of lava issued from the east side of the cone, and was thus invisible from Naples. It ran about one-third of the distance down the entire mountain. . . . I extract the most interesting passages from the report of Signor Scarfoglio, of the *Corriere di Napoli*, who repaired to Vesuvius on May 4, to see, at any rate, the changes wrought by the last eruption, even if he was too late to witness the new lava stream.

"He writes: 'The mountain presented a most magnificent spectacle. A man who had been on the cone on May 3 said that he felt the vibration of the mountain so much that he became sick, and he declares that the motion was accompanied by subterranean thunder. The lava and ashes which fell in obstructed the mouth of the crater, causing it to split at the base of the latest cone on the eastern side. I walked along the edge of this new opening, which is about 60 ft. wide and at least 1,500 ft. long, and descends in a straight line, like a colossal ravine. Its depths are hidden by the sulphurous smoke which ascends from it. The lava has run along this ravine for about a mile, dividing into two streams, one of which has already stopped, while the other is flowing slowly on, a small column of smoke indicating its course. It rolls in the black bed of the old lava, toward San Giuseppe; but this village is still three miles away from the fiery stream, and is in no danger. All shocks of earthquake and explosive sounds have already ceased; around the broken crater the lava is split into larger or smaller crevices, some almost too wide to leap over. Smoke issues from the crater in great abundance, but no more heated matter is being cast up, and the opening is closed by the debris. Who knows where the liquid lava within Vesuvius will find a new outlet? One thing is certain. The mountain is much weakened at the part where the eruption took place, and the side above Resina is the safest.'

"It would seem from this report that, even should the liquid lava within Vesuvius rush upward with such force as it did in 1872, the region toward and around Pompeii would be in most danger, while the thickly inhabited coast at Torre del Greco, Resina, and Portici would be safe. No one can tell whether this last overflow of lava will be the conclusion of the phase of gentle activity of the last few months, or whether it will be the commencement of a still more energetic period."

The Season for Insect Pests.

The caterpillars, which are making their tents earlier this year than usual, owing to the warm spring weather, should be looked after at once. The simplest and perhaps, on the whole, the best way of getting rid of them is to brush off the nests from the trees as fast as they appear, with a long-handled, conical-shaped brush. Early morning or evening is the time when the entire family may be found at home, so that is the best time to destroy the nest.

The codling worm, which infests fruit trees throughout the land, should be looked after at once. There are many ways of getting rid of the pests, but none is believed to be better than spraying the trees frequently with a solution of Paris green.

Of the fly species, the *Country Gentleman* says the horse-fly is the most cruel and bloodthirsty of the entire family. He is armed with a most formidable weapon, which consists of four lancets, so sharp and strong that they will penetrate leather. When not in use they are nicely folded away in a sucker. He makes his appearance in June, and may often be seen in the vicinity of small streams of water. He is said to subsist in part upon an airy diet, and to pass his life harmlessly. Not so the female, for she is armed with six lancets, with which she bleeds both cattle and horses, and even human beings. She lays her eggs in moist places, and, after they are hatched into footless maggots, they make all necessary journeys by stretching and closing the segments of their bodies, their heads being supplied by two hooks, by which they get their food. In process of time this maggot goes down into moist earth, where it reposes for some weeks, after which it bursts the pupa case, and comes forth a large black fly, armed and equipped like its predecessors.

Cattle Branding.

The following paper, by W. M. Goadby, was read at the annual meeting of the Colorado Humane Society, May 21:

It seems proper, at this time, to draw attention to the practice of branding range stock. For many years vast herds of cattle and horses have been pastured on the range, and as the cattle of numerous owners roamed together, it became necessary to resort to branding in order to determine individual ownership.

The method observed is as follows: The stock is rounded up and the calves or colts are taken one at a time into a part of the corral fenced off for the purpose. The herder then throws his lariat so that the noose will encircle the animal's neck, and dragging him to the ground, skillfully holds him, while a comrade uses the branding iron. The branding is occasionally done on the open prairie. Instances are not wanting where the violence of the fall has broken the animal's neck. The pressure of the iron, heated to a red heat, leaves a scar and causes acute pain for some days.

The extent of the practice and the fact that it has existed so long are poor arguments in favor of its continuance. The State Auditor's Report for 1888 shows that the number of cattle in Colorado was, on the 31st of December, 911,989, and the number of horses 170,056, a total of 1,082,045.

The Percheron stallions, the carriage and trotting horses, and certain varieties of milch cows, brought from the Eastern States, have alone escaped branding.

The United States, Australia, and the Argentine Republic are all cattle-growing countries. The question is therefore international. In our own country, where the people are by nature inventive, it ought to be possible to discover a more humane method for the identification of range stock.

Brain Workers.

The *Medical Age* says that the most frequent fault of the brain worker is excessive application to work. "The most intense and fatiguing of toils is pursued almost uninterruptedly, food is neglected, and the claims of exercise and sleep are but imperfectly admitted. Two hours' exercise in the open air, daily, is probably a minimum, and might prudently be exceeded. The brain worker must live sparingly rather than luxuriantly, he must prefer the lighter classes of food to the heavier, and he must be very prudent in the use of alcohol. Tobacco and tea are apt to be favorites with him, and their immoderate use may require to be guarded against. It is a nice question whether he needs more or less sleep than other men. Many men of genius are light sleepers, probably in some cases a misfortune, but there seems some ground for the notion that more than a moderate indulgence in sleep is unfavorable to successful mental effort."

A commentator upon the above remarks says that he cannot fully agree with them. Mental effort, he says, and the Cincinnati *Medical News* agrees with him, causes waste of tissue elements quite as much as bodily exertion, and this demands a full supply of food. What with dyspepsia and absence of appetite, the results of deficient exercise, and the influence of preconceived ideas as to the use or disuse of special articles of food, the brain worker is very apt to receive too little nutriment to make up for the waste. Especially is this the case when he, unconsciously, perhaps, replaces food by the use of tobacco, tea, alcohol, or opium.

Some advise to go supperless to bed. This most medical authorities of the day think is a wrong notion. It is a fruitful source of insomnia and neurasthenia. The brain becomes exhausted by its evening work, and demands rest and refreshment of its wasted tissues, not by indigestible salads and "fried abominations," but by some nutritious, easily digested and assimilated articles. A bowl of stale bread and milk, of rice, or some other farinaceous food, with milk or hot soup, would be more to the purpose. Any of these would insure a sound night's sleep, from which the man would awaken refreshed.

Drilling Cast Iron.

Mr. L. B. Breckenridge, the instructor in mechanical engineering in the Lehigh University, has lately been making some experiments for the determination of the pressure exerted in drilling cast iron. He made a cylinder in which was a plunger having an area of 10 square inches. Three small grooves were turned in the plunger near its lower end so as to prevent any leakage of the oil with which the cylinder was partly filled. Two holes were drilled in the cylinder near the bottom, and a steam gauge and an indicator were attached. The indicator cord was attached to the hub on the shaft of the quick return motion lever in order to obtain diagrams of considerable length. When the piece to be drilled was resting on the plunger, a diagram could be taken which would show the pressure exerted in forcing the drill through the work. With ¼ in. twist drills the greatest downward pressure was 400 lb.; with ½ in., 900 lb.; with ¾ in., 1,100 lb.; with 1 in., 1,450 lb.; and with 1¼ in., 1,800 lb.