Correspondence.

The Hornet's Nest Again.

To the Editor of the Scientific American:

Though I am not a subscriber, nevertheless I am a frequent and an interested reader of the Scientific American. An article on "The Hornet and its Home" appeared in the issue of April 8, 1899, and enlisted my attention at once. The author, Mr. Hervy Laney, is an earnest student of insect life, evidently, and a most pleasing writer.

I make bold, however, to disagree with one of the writer's statements. In the sixth paragraph, concerning the work of the parent hornet, he says: "She carefully places in the cell food enough to last the pupa until it matures into an insect, seals it over with a parchment-like substance, beautifully white, evidently understanding the law of the need of light for the development of the mature insect." I take exception to this on the score that the mother hornet does not complete nor seal the cell containing the pupa. All of the white, translucent part and capping of the cell is made by the pupa itself. When it has reached the sealing age, the pupa emits from its mouth a clear, viscid fluid which it plasters around the rim of its own cell, atop of the mother hornet's work.

As the watery part of the fluid evaporates, it leaves the beautiful white paper finish which is so conspicuous and so charming. Usually the last fourth part of the cell is thus built up and capped by the tiny occupant itself.

My statement can be easily verified by taking a hornet's or a wasp's nest and hanging it in a place where no mature insect can reach it, and yet a place that is warm enough to keep the pupa alive. In a very short time the young insect can be seen worming its way down to the edge of the cell and beginning the work of temporary self-imprisonment.

Altoona, Pa. Henry Howard Stiles.

Metal and Wood Railroad Ties.

By George E. Walsh.

The paper read before the International Railway Congress, and published in the Bulletin of the Association, giving some new data about the relative merits of wood and metal railroad ties used by the Liége-Limburg Railway, of Belgium, and commented upon in a recent number of the Scientific American, is interesting in view of some modern experiments in this country with wooden sleepers. The fear that the supply of timber would soon become exhausted, and the price of railroad ties would as a consequence advance to an abnormal figure, has not in recent years troubled railroad companies as much as it did fifteen and twenty years ago; but in spite of the fact that ties do not cost any more to-day than they did ten years ago the railroads have not lost sight of the possible danger they may have to confront any day in the future. The drain upon the forest for supplying the roads with ties is an important one. Fully twenty per cent of the total consumption of lumber is used by the railroads for their ties, telegraph poles, and stations, and as a large proportion of this timber comes from the young, thrifty trees before they have reached full maturity the destruction is far-reaching in its effect.

The effort to economize in the matter of ties and telegraph poles has been one of the features of modern railroad management. Lately the Forestry Division of the Department of Agriculture has instituted careful experiments and researches for the purpose of lessening the forest destruction by the railroads. Until metal ties are substituted for wooden ones the drain upon the forest will be enormous. In Europe, where lumber is scarce and high-priced, metal ties are in common use, but the fact that they have not found favor here is due to the relative abundance of forests and the unwillingness of American railroad companies to adopt an inferior substitute. When the perfect metal tie has been found, the roads will quickly take it up and make the fortune of the lucky inventor.

The question of increasing the durability of timber is more important to the railroads than to any other class of consumers. In the past the average life of a tie in the United States has been a little less than seven years, and if this can be increased to ten the saving to the railroads of the country would be enormous. It takes upward of 80,000,000 ties to renew those worn out and decayed; that is, the average of renewals needed for each mile of track each year is 417 ties, or about 15 per cent of all the ties on the track.

To increase the durability of the ties the Forestry Division has made experiments which go to show that the time of felling the timber has much to do with the length of the life of the ties. Early winter cutting is recommended for various good reasons. There is the minimum of sap in the trees then, and the weather is too cool for fermentation to get in, while the trees will season more slowly and evenly. Moreover, trees cut in the sap are more liable to the attacks of insects. The decay of wood is caused by a fungus which lives on the wood, and warm weather is favorable to the growth of this rot. Some woods are more susceptible to the attacks of the fungus than others, but the little animals will in time injure the best timber, and cause what we call rot. When damp or sappy the fungus enters the wood more readily than when dry and cold. To prevent the fungus from attacking the ties it is recommended by the Forestry Division to paint the ties and poles with various compositions. A mixture made up of three parts coal tar and one part unsalted grease is considered one of the best compounds for painting the newly cut railroad ties. Carbolineum, made of heavy tar oils freed of their volatile and heavy tar constituents, is a mixture that many of the roads use for their ties. This oil not only forms a protecting coat for the ties, but it acts as an antiseptic, penetrating the wood and killing the fungi. By adopting these various preservatives some of the roads have increased the average life of their ties from seven to eight and nine years.

In the East the bulk of the railroad ties are cut from second growth timber. The specifications of the roads demand that only one tie shall be cut from each tree, and this method secures the choicest ties, but it denudes the forests rapidly. As only straight, perfectly developed trees are selected for ties, the woods are left with only the small inferior trees. This does not improve the looks of the forests, nor does it promise much for the future. It is only a question of time before all the good trees suitable for ties will be cut down, and the supply will be reduced so that metal substitutes will have to be found.

Substitution of wood for ties has already undergone a great change. Originally the chestnut was considered the finest tree for supplying railroad ties, but forests of chestnuts are scarce in all parts of the country. Oak and pine have both succeeded the chestnut. Of the 80,000,000 ties used for renewals each year, about 45,000,000 are cut from oak trees, 12,500,000 from pines, 3,500,000 from chestnut, 5,000,000 from cedars, 2,500,000 from hemlocks and the tamaracks. 2,500,000 from redwoods, and 1,500,000 from the cypress trees of the South. Thus the oaks furnished about 60 per cent of all the ties cut annually. The use of the pine trees of the South for railroad ties is rapidly increasing, and when the turpentine or pitch is left in them they last as long as many of the hard woods. This pitch acts as a natural preservative.

When the ties are cut they have to be piled in neat square heaps according to a system that has been found to give the best results. Careless piling of the ties has cost the railroads thousands of dollars in the past, and now they all insist upon proper piling. This consists in putting not more than fifty ties in a heap, and arranged in a square so that each tier contains from six to nine ties, separated from each other by a space equal to the width of one tie. The next tier is made up of one tie at each end, placed crosswise, so that the ties are all separated from each other. By this method the wind circulates freely through the piles, and causes uniform and slow seasoning.

Railroad ties are both sawn and hewn. The former can be had more cheaply, but the latter last much longer. Some roads claim that the hewn ties will last from one to three years longer than the sawn ties. The rougher surface of the sawn ties collects the water, and thus gives the fungus a better opportunity to grow. Nevertheless, the amount of waste of lumber necessary to make the hewn ties often more than counterbalances this difference in the cost.

There is a great diversity in the number of ties used to the mile on the different railroads as well as in the size and quality of timber. The New York, New Haven and Hartford road use 2,800 ties to the mile, three-quarters of which are chestnut and one-quarter oak, while some roads use as few as 2,000 to 2,500 to the mile. Over 60 per cent of the ties are cut 8 feet long, 12 per cent 9 feet long, and the rest 8½ feet. The 9-foot ties are used chiefly by the Southern and Gulf group of railroads, where pine timber is very abundant and cheap. The New England roads have their ties cut from 5 to 6 inches in thickness, while the Southern roads seem to prefer 7-inch ties. The width of the ties likewise varies from 5 and 6 inches in New England to 8 inches in the Central Northern and the Southern roads.

The tendency to economize on the ties in the East is thus apparent in the size of the sleepers selected, while in the Southern and Western States where timber is plentiful there is no such attempt to reduce the width, length, and thickness of the ties. The denudation of the forests in the East has made it difficult work for the great railroads to secure all of the ties they require for annual renewal of the roadbed. Most of them have exhausted all of the available timber along the line of the track, and with the exception of a few scattering lots cut by farmers and small wood owners the ties have to be brought from long distances. One of the important phases of the coast trading business of our lumber ships is the carrying of railroad ties from the woods of Canada to New York and Boston. Cedar ties are now brought in large quantities from New Brunswick and the woods of Maine to this city. This white cedar makes pretty good ties, and its abundance makes the ties cheap. The lumber schooners come from New Brunswick by way of the Bay of Chaleur, the great shipping point for cedar ties, and they are delivered by cargo lots at 30 cents apiece. Hundreds of thousand of the ties are shipped by rail and delivered to the New York and New England roads at the rate of $12 per thousand feet, board measurement. Besides white cedar ties from the woods of Maine and New Brunswick there are smaller lots of chestnut, oak, tamarack, and hemlock sent down.

One of the greatest innovations in recent years has been the trade in Southern pine trees. An immense business has developed in the South in cutting and shipping railroad ties to various parts of the country. These pine ties are both hewn and sawn, and they are shipped north in immense quantities both by rail and boat. The pine ties do not last as long as oak or chestnut, but they are cheaper, and the supply seems almost inexhaustible. It is probably the discovery of the value of the Southern trees for making railroad ties that prices have been kept down in recent years. In some localities ties are actually cheaper to-day than they were five, ten or fifteen years ago.

Preparation of Rubber from the Leaves of the Rubber Tree.

The French consul at Singapore, M. Jouffroy d'Aabns, in his report lately presented to the Minister of Commerce at Paris, gives some interesting information relating to the rubber industry as carried on in that region, and especially that relating to a new process for its extraction from the leaves of the rubber tree.

Experiments have already been made in this direction within the last few years, and a new industry has thus arisen. The leaves of the rubber tree, principally that variety known as the Isoandria Hookerii, are exported in the dry state from Singapore, Sumatra, Borneo, etc.

They are pressed into bales of 150 to 200 kilogrammes and sent to factories in Europe, one of which is at Brussels, another at Orleans, France, and a third near Paris. In considering the question, M. d'Aabns concludes that it is not probable that a good quality of rubber is to be obtained by the process of treating the dry leaves, for the following reason. Being a vegetable gum of extreme sensitiveness, it is subject in its natural state to modifications and changes of structure upon a prolonged exposure to the air. This oxidation, in the case of the gum or the leaves containing it, is carried on rapidly upon contact with air, and in consequence its durability and solidity are diminished, and many of its most valuable properties are lost. It thus becomes of little value as an insulator for wires or cables. Thus the gum extracted from the dry leaves is of an inferior quality, and especially so, as the European works treat these leaves by chemical processes, all of which tend to destroy its structure. The product so obtained may, indeed, be used for various purposes where a first-class quality of rubber is not required.

The question then arises whether or not it is possible to obtain rubber of the best quality by treatment of the leaves. This problem has been studied for several years at Singapore, under the supervision of the French government, but, until recently, without success. It has been found that the leaves must be treated while green, and by other than chemical processes in order to avoid oxidation and changes in structure. This problem has at last been solved by M. Ledboer, formerly professor of physics at the Sorbonne, and his process is eminently practical and easily worked on a commercial scale. M. d'Aabns has visited his plant and has seen the process of extraction of rubber from the fresh leaves carried on with success. The inventor has recently made a contract with a large company—the English Extension Company—for the use of his process, and a Dutch company has lately been formed to carry out the process in a part of the Dutch East Indies.

As the collected fresh leaves should be treated on the spot, to avoid the bad effects of drying, the plant must be in the neighborhood of the forest. It has been found that the rubber plant may be cultivated, and plantations formed which will yield a good product of leaves in their fifth year, while, on the other hand, the trees do not furnish sap by boring until their fiftieth to seventy-fifth year.

It is estimated that a suitable plant could be installed for about $30,000. This may easily be erected under the supervision of an engineer with the help of native labor.

During the first five years, while waiting for results from the plantation, leaves could be obtained by contract with the natives, who would collect them in the forests. After five years, an important production of leaves from the plantation would furnish an addition to the total, and after ten years the plant would be entirely independent of the natives, the whole amount of leaves being obtained from the plantation. A large company is now in formation at Rotterdam, which will, no doubt, secure a monopoly for the Dutch possessions in Borneo and for Sumatra. It is estimated that the annual exportation from these regions equals 3,000 tons.

Science Notes.

At a recent flower show in England some sweet pea vines were exhibited which were grown from seed taken from the tomb of an Egyptian mummy buried some 2,000 years ago. The blossoms were of a delicate pink and white and were less than the ordinary size.

Mr. Spencer, an aeronaut, together with a companion, left the Crystal Palace, near London, and landed between Treport and Dieppe, France, on July 29. In crossing the Channel they were obliged to throw out everything to prevent their falling in the water; even their anchor was abandoned. The balloon then attained an altitude of 12,000 feet.

A Chilean snake charmer was recently bitten by a Gila monster while giving a performance at Coney Island. The wound was dressed by a doctor, who tied a tight bandage about the wrist, drawing out the poison. The snake charmer had tied a tight compress about his thumb. This probably prevented the poison from spreading through the system, and undoubtedly saved his life. The bite of one of these snakes usually results fatally.

There is one department of the municipal government of New York which does not cost anything and into which politics do not enter. This is the Municipal Art Commission, which passes upon the artistic merits of all paintings, statuary and other works of art offered to the city. The commissioners serve without salary and they are their own clerks. They pay no office rent, meeting at their offices and houses. Owing to a wise provision of the new charter, the Mayor is compelled to select the members from a list prepared by an association of art societies called the "Fine Arts Federation," so that it is strictly non-partisan.

A large percentage of the flowers which are exhibited at horticultural shows show the results obtained by crossing different varieties, so the deficiencies in one may be made good by the virtues of another. The Department of Agriculture is studying how to obtain orange trees that possess greater hardiness, and at the same time produce a delicious fruit. Their efforts have been crowned with success. The sweet orange was crossed with the Japanese orange, which resulted in the production of a hybrid that is much hardier than the ordinary sweet orange. The department is also experimenting with crossing sea island cotton with upland cotton, and the pineapple has also been the subject of experiment.

It seems we have at last aseptic dueling. According to The Medical News, in a recent Paris duel, whenever the sword of one of the gentlemen who sought this foolish manner of settling their differences touched the ground, the duel was instantly interrupted until the blades were thoroughly sterilized by passing through the flame of an alcohol lamp. What is specially feared is that the swords may become contaminated with the bacillus of tetanus. A French surgeon has issued a book giving regulations for the proper conduct of a surgeon when summoned to a duel. The most rigidly surgical sterilization of the dueling swords is recommended, and their careful preservation in the state of most absolute asepsis until they are handed to the duelists.

For the first time the Census Bureau is to have a home of its own. Heretofore it has been impossible to accommodate under one roof the clerical force required to perform the great amount of work involved in taking the census. At the 1890 census it was necessary to occupy nine or ten buildings in different parts of Washington in order to find office room for the clerical force. The new building will cover two acres of ground, and will be situated at the corner of First and B Streets, N. W., Washington. The main building will be one story high; the administrative will be two stories. The building will accommodate a force of clerks numbering 2,000 to 2,500. A considerable portion of the space available will be needed for printing. The building will be of brick, plain but substantial. It is expected that the building will be ready for occupancy soon after the first of January, 1900.

Notwithstanding the very severe edicts which have been passed in Italy to keep masterpieces of art from being alienated, the "Chigi Botticelli" was recently sold for $63,000. Under the Pacca edict the picture could not be sold by auction. The result was that Prince Chigi held an informal "sale" at his house, in which there was no auction, but merely a "competition" among buyers to see who would offer the most. It is difficult to see where is the distinction. According to law, the purchaser sent his card to the Ministry of Public Instruction, stating that he was the purchaser of the Botticelli. The officials informed him that his declaration must be made on stamped paper. The buyer complied with these conditions, but all the time the picture was traveling toward the frontier in the bottom of a trunk. It was found that the visiting card was false and that the document on stamped paper was also false, and the buyer has not been heard from since. Signor Baccelli is a good executive, and will undoubtedly make trouble for some one for this scandalous transaction.

Engineering Notes.

The American Line steamer "Paris" left Falmouth on August 14, under her own steam.

Emperor William visited Dortmund on August 11, and opened the Dortmund-Ems Canal.

A De Laval steam turbine motor has been used in a slate mine for running a ventilating plant. The high speed of the turbine is reduced by means of proper gears, so that the actual speed of the fan is about 1,000 revolutions per minute.

Notwithstanding an increase of the outputs of all products of Baku, Russia, about 200,000,000 gallons of petroleum in a total of 2,000,000,000, the average whole output per well has fallen from 225 gallons in 1896 to 199 in 1898. This would apparently indicate a permanent weakening of the wells.

The British steamer "Puritan" sailed from Philadelphia on August 12, with a large cargo of railway materials, in fact the largest cargo that has ever been taken from any port of the United States. She took out forty Baldwin locomotives and tenders, and eighteen steel bridges for the Chinese Eastern Railroad, in addition to several tons of miscellaneous cargo. Another steamer will leave in a few weeks with a similar cargo.

The number of failures from all causes in automatic block signals as compared with the total number of movements of each signal does not exceed more than one in 30,000, says The Railroad Gazette. In case of failure of a signal it causes a stoppage of the train until the cause can be ascertained. The failures which are entirely erroneous, that is to say, which make a signal show safety when it ought to show danger, are less than one in a million movements. This is a far better result than can be obtained from any system of block signals depending upon human agency.

The Navy Department has received from the agent of Vickers & Maxim, of England, reports of the trials at the company's proving ground of the new 6-inch quick-firing gun and mounting manufactured by the company for the navy. This gun was ordered by the Chief of Ordnance of the Navy a year ago. In the recent trial a number of charges of cordite were fired with very satisfactory results. The rate of ten rounds per minute was obtained. This gun has been adopted by the British Admiralty, and the United States recently purchased the right to use its mechanism.

The Gruson Iron Company, of New York, which was recently incorporated, has acquired the exclusive right in the United States to manufacture chilled cast iron rotating turrets and other chilled armor construction for coast defense and also all the rights for the manufacture of port gun carriages and all machinery connected therewith. According to the contracts, the German allied firms of Krupp and Gruson are to furnish all possible information and experience required in the process. A large plant will be constructed at some point which has not yet been determined upon.

Workmen who are engaged in digging a trench in Park Row, New York city, in front of the Federal building, have unearthed a section of the first water main ever laid in the city, being one of those put down by Aaron Burr's company. Clay pipes were at first used, but the expense of their manufacture was so great that they could not be used, and chestnut logs were substituted. Those which have been unearthed were found to be in good condition. We have on another occasion described the interesting water tank by which Aaron Burr's banking company obtained its franchises.

Bearing on the question of standardization is the uniformity in screw threads, and Continental papers are now referring to the success of the movement inaugurated in 1895 and concluded last October, with regard to the Continental solution of what had been a great difficulty. Last winter a conference of representative machine makers of France, Italy, Switzerland, and Germany was held at Zurich, when it was agreed that gages and threads should be stipulated in millimeters instead of the English inch, and we now learn that the plan is proving most acceptable. Hence another reason for the adoption of the metric system by the engineers and manufacturers of this country.—Industries and Iron.

Five hundred men were discharged from Cramps' ship-yard, Philadelphia, on August 15, and last week 300 were also discharged. It is not on account of lack of work, but lack of steel, and it is likely that 1,500 more will be dropped within a week. There are large quantities of material at the yard but it does not come in the order which is required for use. Several ship-yards on the lakes have had to close entirely because they cannot get the steel they want. Of course, ship-building does not make any great draft upon the steel product of the country, for it is estimated that only about three per cent of the steel manufactured goes into ship-building. The Pressed Steel Car Company, which requires one thousand tons of steel a day, cannot get more than six hundred tons. All of the steel mills are far behind in their orders, and it will take some of them many months to fill their orders.

Electrical Notes.

In some places trolley companies are cultivating strips of lawn between the tracks, producing a most pleasant effect. The Electrical Review remarks that grass in the streets is now a sign of progress rather than of retrogression.

A South Side church in Chicago has a steeple on which arc lights are placed. The lamps are 225 feet above the level of the street, and, as it might be imagined, produce an excellent effect and serve to effectually advertise the church.

A correspondent informs us that on the Milwaukee-Waukesha electric line air brakes and air whistles have been used with much success. The distance of twenty miles is made in fifty-five minutes, so that there is need for effective brakes and whistles. We noted a short time ago that they were to be applied on the cars between St. Paul and Stillwater.

There are two electric tramways in operation in Holland. One is from Vaals on the German frontier which is only half a mile in length, and the line from The Hague to Scheveningen is somewhat over six miles. The cars are actuated by accumulators, as the trolley system is forbidden. Holland is a country of short distances, and it ought to be an ideal location for tramways.

The Baldwin Locomotive Works, of Philadelphia, have recently constructed two electric locomotives for the Imperial Government of Japan, where they will be used in the coal mines. These are the first engines of the kind which have been exported from America. Their height from the rail, exclusive of the trolley, is 2 feet 10 inches; width, 4 feet 2 inches; length over end bumpers, 11 feet 8 inches. The locomotive complete weighs 12,050 pounds, and is of twenty horse power. It has a speed of 8 miles per hour.

In Germany electric plowing compares favorably with steam plowing as regards expenses. The cost of electric plowing in heavy soil with deep cultivation is from $11.25 to $14.25 per acre, while steam plowing costs $21.25 per acre. The mechanism used on the royal farms in Prussia consists of a motor wagon containing a motor driving the winding drums, and the motor may also be coupled to the driving wheels of the wagon to give it the proper advance at the end of each traverse of the plow. The depth of the furrow is 8 to 10 inches and the speed of plowing is about 3 feet per second.

We have already referred to the offer of President C. J. Glidden of the Erie Telephone and Telegraph Company of a million dollars for a telegraph repeater and telephone quadruplex. He has received a large number of letters, and he states that many persons have entirely misunderstood the offer, and inferred that the sum is to be set aside to be used by inventors to assist them in their efforts to produce such a device. The offer is, however, only for a perfect device fully covered by United States patents which are to be assigned, the instruments when used on telephone circuits to produce the same results, telephonically speaking, as the telegraph repeater and quadruplex in the workings of the telegraph circuit.

Some interesting experiments were recently carried out at Newbury, England, in wireless telegraphy and by means of the Hertzian waves. According to The English Electrician, the first experiment consisted in blowing up a miniature powder magazine at a distance of 400 yards. A balloon fitted with wireless signaling apparatus then made an ascent and continuous signaling was carried on between the balloon and the ground. Small cartridges of guncotton suspended from the balloon car were also fired from the ground when the balloon was a long distance away. These experiments demonstrate that the explosives can be readily fired at a considerable distance by means of Hertzian waves, and secondly, with proper precautions, wireless signaling can be carried on in the neighborhood of such explosives, even though they are in a condition to be fired by more Hertzian waves than those used for the signaling. The experiments are not regarded as of much value by another English electrical journal.

Electricity would be a great advantage to the farmer if it could be readily obtained, and it would be interesting if some farmer of means would install a fine electric plant. Of course, it is useless to expect that the majority of the farmers will ever adopt any electrical plant, owing to the very large expense of such installation. Electricity would prove very useful in plowing, and many experiments have been made, but little has been done except to substitute electricity for steam power in connection with machine plows already in use. Where electric power is available, it is possible to install at a moderate cost a system of light railways connecting the various buildings and fields, so that most of the hauling can be done by power. In stacking hay in large barns electric power would prove very useful. Machinery around the farm is usually distributed at a number of points, for instance, hay cutters will be in one place, pumps in another, etc., but with electricity at hand, all the machinery can be run by isolated motors.