Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

It has been reported around this city and telegraphed to other places that another appropriation had been asked for by the Commissioner of Patents to complete the restoration of the burnt models. Information from headquarters, however, contradicts this, and it is stated that, so far from a new appropriation being required, it is believed that the present one will be sufficient to restore all the models that are really worth the trouble.

It may be interesting to your readers to know the means adopted in restoring the models, as there are no doubt tens of thousands of them who have models in the office. Most of this work of restoring models is done in the North Hall, one that was formerly considered the finest of the four halls forming the model museum. It was the last wing of the Patent Office finished, and probably furnished a resting place to many of your soldier readers, for it was used as a hospital during the war, and just before it was fitted up to receive the models it was used for the Inauguration Ball at Lincoln's second inauguration, so that it has seen gay times as well as sad ones. At the present time it presents the appearance of a huge machine shop, except that comparatively little machinery is employed, which consists mostly of small lathes run by foot power, and two or three portable forges. The models are first picked out of what appears to be heaps of scraps, and arranged as near as possible in the classes to which they belong, the location in which they are found being in many cases the only clew to the class. The examiners in each class them compare the models with the drawings which accompanied them when originally filed, and affix a card to each giving the name of the inventor, the date of the patent, and the name of the invention. The model is then entered in a book, with a description of its appearance and condition, and is then passed to the laborers for cleaning. The first operation is to pickle it in a solution of sulphuric acid to eat out the rust and dirt, and then wash it in a bath of lime water to counteract the acid left on its removal from the pickling tank, after which it is dried with sawdust. Then, if needed, the model is put to soak in a bath of kerosene oil to loosen the screws and such other adhering parts as could not otherwise be readily started, and after draining it is passed to a machinist, who now cleans, refits, and repairs it as far as possible or allowable. In many cases the model has simply been bent out of shape by the heat, and it is then taken to pieces and the bent parts straightened by the aid of the portable forges. If any part is missing search is made for it among the miscellaneous mass of pieces, and when found it is replaced in proper position. In many cases small parts are made and added to the model to make it complete, which parts, however, are always made to correspond exactly with the drawing. The model is then taken back to the bookkeeper, who enters it upon his register the second time, with a description of the part that has been added, and the model is then transferred to temporary cases in the West Hall, looking in many cases better than it did when originally filed.

PATENT MATTERS BEFORE CONGRESS.

A bill has been introduced into the Senate by Mr. Johnston enacting that in all cases where patents have been passed and allowed since July 8, 1870, but have been and are still withheld by having been declared forfeited under section 4885 of the Revised Statutes, because of the non-payment of the final fee within the time prescribed, the Commissioner of Patents, upon payment of such final fee within six months after the passage of the Act, shall issue the said patents as if the final fee had been paid within the time heretofore prescribed by law; but no person is to be held responsible for infringement for having used or made any articles previous to the issuing of such patents for which any patent may issue under the Act.

Mr. Pridemore, of Virginia, who some weeks since introduced a bill to amend (?) the patent laws, so that patents upon agricultural, horticultural, and mechanical implements should only run for eight years and not be extended beyond that term, has had a hearing before the House Committee on Patents, in which he held forth in favor of the eight years' limit to patents, but it is not believed that there is any probability of such bill passing.

A bill has been introduced by Mr. Dwight, allowing the Commissioner of Patents to extend the patent of Edgar Huson, for wagon gearing, dated February 17, 1857, which has already been once extended.

TORPEDOES.

Mr. McPherson has introduced a bill into the Senate appropriating $250,000 for experiments with and for the purchase of an improved movable torpedo, after competitive trials under the direction of a board, to be designated by the President, of two officers of the Ordnance Corps, two of the Corps of Engineers, and one of the Board of Supervising Inspectors of steam vessels.

MEMPHIS BRIDGE.

A bill has been introduced by Mr. Money, into the House, authorizing the Arkansas and Tennessee Bridge Company, and the Tennessee Construction and Contracting Company, to erect a bridge over the Mississippi river from Memphis to Hopefield, Ark., having one unbroken or continuous span of not less than 500 feet from pier to pier over the main channel, and to be so built as not to interfere with the free navigation of the river. If preferred, however, the companies are to have the privilege of constructing a tubular bridge through the waters of the river, or a tunnel thereunder, provided that the same does not interfere with the navigation of the river.

CANAL THROUGH THE ROCKY MOUNTAINS.

Mr. Grover has introduced into the Senate a bill authorizing the survey of a water route from the Atlantic to the Pacific, which provides that the Secretary of War shall appoint two commissions, each to consist of three officers of the Engineer Corps of the Army, and three Civil Engineers, who shall survey a route and mature plans for uniting the Missouri with the Columbia river, by the construction of one or more canals connecting any of the affluents of the two rivers. A second section authorizes the President to enter into a negotiation with the government of Great Britain and British America, for the free navigation of the Saskatchewan and such portions of the Columbia river as may run within British territory. By a third section an appropriation of $50,000 is made for the expenses of the commissions.

COTTON WORMS AND GRASSHOPPERS.

The House Committee on Agriculture has agreed to report favorably, with some amendments, Mr. Shelley's cotton worm bill, which provides for the appointment, by the Commissioner of Agriculture, of a commission to inquire into the origin of the cotton worm trouble, and, if possible, suggest a remedy.

The same committee has under consideration an application from the people of Taos County, New Mexico, for assistance on account of their sufferings from the grasshopper plague.

In connection with this subject it may be stated that an elaborate and carefully prepared report has been submitted to the Secretary of the Interior by the Entomological Commission, containing a mass of facts respecting the migration and habits of grasshoppers, whose ravages have for several years caused so much loss to the western farmer. It would appear from the report that it is not beyond the scope of human ingenuity to restrict the ravages of this pest, and that their absolute destruction may possibly be accomplished. The area subject to the devastations of the grasshoppers is estimated at upwards of 1,500,000 square miles west of the Mississippi, and extending northwesterly into British America. There has been some correspondence with the Dominion Government looking to coöperation with us in the continuation of these investigations, but nothing definite will be done by that government until it is known whether Congress will appropriate sufficient funds to continue the Commission. The Commission also suggests an extension of their labors into the field of operations of the cotton worm, which, it is said, causes the loss of not less than $20,000,000 annually. If the Commission is continued it expects to be able to render valuable aid to the country by its researches into the nativity and habits of, and its suggestions as to the best modes of fighting, the insect pests of both south and west

THE PARIS EXPOSITION.

Every month or so a report is started in this city that on account of war complications the Paris Exposition will be postponed, and the report is telegraphed all over the country. This has just occurred again for the fourth or fifth time, and the report, as usual, on due inquiry at headquarters, is found to be without foundation. In the meantime preparations are rapidly going on at the Agricultural Department for as full a representation of our products, etc., as possible with the limited time and money at the disposal of the Commissioner. He has issued a circular stating that he is collecting and preparing suitable specimens of the agricultural productions of the several States and Territories of the Union for exhibition at Paris, and he therefore solicits from any source specimens of native fertilizing materials, vegetable products of every description, and of materials manufactured from such products.

Encouraging responses have been received from many of the States, and specimens of their productions are now being received, and other contributions are in preparation.

The Department has prepared from material on hand a collection of sections of the woods of our forest trees that have an established commercial valuation, a series of models in plaster of typical specimens of fruit and vegetables, and cases of insects injurious to the principal crops. In addition to this a collection of native wools is to be formed, and a series of working models of machinery and apparatus employed in the growing and utilizing of agricultural products, plans for illustrating our methods of farming, fruit-growing, irrigation, etc., are to form part of the exhibit.

FLOUR BY MAIL.

The following clipping from the *National Union* of this city, besides giving a pretty accurate view of the state of affairs connected with sending flour by mail, shows the effect and value of a notice in the SCIENTIFIC AMERICAN:

"The announcement in the last issue of the SCIENTIFIC AMERICAN that the Post Office Department had under consideration the matter of permitting 'flour' being sent in the mails at third-class rates, provided any device could be invented by which that and kindred material could be so inclosed as to admit of examination without danger of leakage, has waked up inventors in all parts of the country, and they are sending specimens to the Department in such quantity as actually to prevent acknowledgment of their receipt. Most of these inventions are neither new, practicable, nor desirable, and but few of them are deemed worthy to be tested. The principal idea is to make a box or package in which flour can be inclosed in such a way that the postmaster where it is deposited for transmission may be able to ascertain what is contained therein without breaking it open or otherwise disturbing the contents, whereby they would be sifted out in the mail pouches, to the injury of the mails; and few have yet come within hailing distance of an acceptable arrangement to that end. In the meantime, the Post Office Department languishes under the accumulated weight and number of the contrivances presented, the most practical of all which is a little wooden box, with a mica tag fastened in with putty, which in the corner of a heavy mail pouch would last about half a moment under the rough handling to which the mails are subjected."

MAKING IRON AT THE NAVY YARD.

As previously announced, experiments have been making as to the probability of successfully and economically manufacturing iron at the Navy Yard, in this city. It is now announced as the result of these experiments that it has been demonstrated that the Government can economically manufacture its own iron here, from whence it can be shipped to the various navy yards as wanted. It has been ascertained, it is said, that the necessary adaptations for the purpose can be made in our Navy Yard for about $10,000, and that Government can save that sum in one year by manufacturing its own iron from the accumulated scrap. It is thought that if this work is once started it would extend so as to embrace the making of iron from the ore, as we have direct and cheap water communication with coal and iron localities in Maryland and Virginia.

OCCASIONAL.

Washington, D. C.

Tea Culture.

To the Editor of the Scientific American:

In looking over a file of American papers the other day, I came across an article headed "American Tea," taken from the Philadelphia *Press*. The article went on to state that "cultivation of tea will speedily be proceeded with in the New World, and the Pacific section of America is probably destined to be the great tea producing country of the future, and thus solve the vexed question of Chinese labor on the Pacific coast."

I need not say with what deep interest I read the above, being a tea planter myself, and interested in a movement just started for introducing Indian teas to the American public. But why should not America grow her own tea? And in answer to that question I beg leave to make the following remarks on the suitableness of America as a tea growing country:

In fixing on any district to plant tea in four things have to be considered, namely, soil, climate, labor, and means of transportation. Tea, especially the China variety, will grow in very varying climates and soils; but it will not flourish in all of them, and if it does not flourish, and flourish well, it will certainly not pay.

The climate required for tea is a hot, damp one. The rainfall should not be less than 70 to 90 inches per annum, and the more of this that falls in the early part of the year the better; any climate suffering from drought in the early part of the year is not so good as one where the rain is more equally diffused. All tea districts would yield better with more rain in February, March, and April, and therefore where fogs prevail in the mornings at the early part of the year are so far benefited.

The less cold weather experienced where tea is, the better for the plant. It can stand and will grow in great cold; but I do not think it will ever be grown to a profit on such sites. The climate cannot be too hot for tea if the heat is accompanied with moisture.

Tea grown in temperate climates, such as moderate elevations in the Himalayas, is quite different to the tea of hot, moist climates, such as Eastern Bengal. It is much weaker and of very little use for mixing purposes. On the other hand, the Indian teas of hot, moist climates have great value for strength and pungency. Another important point in fixing on a climate for tea is the fact that apart from the strength the yield is doubled in hot, moist climates to what it is in comparatively dry and temperate ones.

Sloping land is objectionable. It cannot be highly cultivated, and high cultivation means large outturn. Of flat lands there are two kinds suitable for tea, table and valley land; the former is very rare in the tea districts of India. The best valleys are those with a gentle slope both ways, one toward the lowest line of the valley, the other toward the mouth, thus making a natural drainage during the rainy season. Flat lands can be highly cultivated; steep slopes cannot. Tea pays best with high cultivation; *ergo*, flat lands are preferable.

That there are portions of America suitable for the cultivation of tea I have not the slightest doubt, and, provided labor could be had at moderate rates, America would in a very few years compete favorably with China and Japan in supplying the markets of the world with tea. Before machinery was introduced into the districts of Assam and Cachar it required about two adults per acre to work gardens successfully; but now, thanks to machinery (and none of the best), we can do with half that number. Machinery is yet in its infancy out here, and in this respect America would have greatly the advantage over China and India; her resources being unlimited as regards intelligence, means of transport, and mechanical appliances. And these are what we lack out here—machinery none of the best, and worked with the greatest difficulty, transportation of the most primitive kind and very slow, and, however noted the Hindoo may be for mildness of disposition, he cannot plead guilty to a very large share of intelligence.

Supposing that a suitable climate was found in America for the cultivation of the tea plant, easy access to the European markets, cheap and rapid means of transportation, unlimited mechanical appliances, would enable the planter to offer the public a better and cheaper article than they now receive from China and Japan, and as an enterprise would offer a safe and profitable investment for the money.

Varieties of the tea plant are many, but they all arise from two species, the China plant, the common tea plant of China, and the indigenous plant first discovered some forty years ago in Assam.

These are quite different species of the same plant, and how produced, by climate, by soil, or in what way, no one knows. But they do differ in every respect. The indigenous tea grows quicker than the China if it has not been overpruned or overplucked. In other words, it flushes quickly, for flushing is growing. The indigenous does not run as much to wood as the China. The indigenous tea has a leaf of nine inches long; the leaf of the China bush never exceeds four inches. The indigenous leaf is a bright pale green, the China leaf a dull dark green color. The indigenous "flushes," that is, produces new leaf, much more copiously than the China, and this in two ways: first, the leaves themselves are larger, and thus if only even in number exceed in bulk what the China has given; and secondly, it flushes oftener.

The infusion of tea made from the indigenous species is far more "rasping" and "pungent" than what the China plant can give, and the tea commands a much higher price in the English market.

I have now, I think, pointed out the leading characteristics of the two original varieties of the tea plant, and it stands to reason no one would grow China who could get indigenous. But the truth is, a pure specimen of either is rare. The plants between indigenous and China are called "hybrids." They were in the first place produced by the inoculution when close together of the pollen of one kind into the flower of the other, and the result was a "hybrid," partaking equally of indigenous and China characteristics, and has proved itself and is acknowledged by all planters to be the best class of plant for gardens.

It is evident, then, that the value of a garden depends much on the class of its plants, and that a wise man will only propagate the best. Only the seed from good varieties should be selected, and when this shall have been systematically done the yield per acre will far exceed anything yet realized or even thought of.

The American government should follow the example of the English government by establishing an experimental plantation in the most favorable locality, and under the management of an experienced planter who would insure the best possible results. Who can tell what great results a few years might bring about?

The following is about what it costs to put out 200 acres in this district, and the estimate leaves a wide margin to go on:

Total expenditure, first year	$18,000
" " second year	12,000
" " third year	9,000
	$39,000
Outturn the 2d and 3d year, 170 lbs. per acre, at 40c. per lb., 34,000 lbs.	13,600
Balance	$25,400
Working expenses for 4th year	12,000
	$37,400
Outturn the 4th year, 320 lbs. per acre, 64,000 lbs., at 40c	24,600
	$12,800
Working expenses 5th year	10,000
	$22,800
Outturn the 5th year, 400 lbs. per acre, 80,000 lbs., at 40c. per lb	32,800

At the end of the fifth year all invested capital is paid up, $9,200 profit, and the possession of tea property worth at least $80,000.

The above is a very fair estimate of the working of a garden in Cachar, and I believe it could be done for less in America, providing the climate was suitable.

Trusting you will pardon me for trespassing on your valuable space, yours faithfully,

JAMES L. FORBES.

Burtall Tea Garden, Luckiepore, Cachar, Eastern Bengal, East India, January 10, 1878.

Origin of the Potato Disease.

To the Editor of the Scientific American:

By recent discoveries of some English scientists so commonplace a subject as the potato disease has been brought into prominence as an element of scientific importance, and would seem to be a genuine *bête noir* in the discussion of the question of "spontaneous generation," now so sharply dividing the ablest of our scientific investigators and writers.

When the potato disease first made its appearance in Ireland, and occasioned a famine by its rapid destruction of this favorite esculent, it was the popular belief that the plant, by long and forced cultivation, had exhausted its vitality, and a fresh start would have to be made with seed from the region where the plant is known to be indigenous. The belief that the plant had run its course, or completed the cycle of its life, was strengthened by the failure of the crop from the same cause in countries remote from the region first infected.

The mystery, however, which enveloped the nature and cause of the disease was eventually dispelled by the researches of distinguished scientists, who discovered and described the fungus, *Peronospora infestans*, which is the germ of the disease. The rapid spread of the disease over the country where it seems to have originated, its following the channels of commerce, and almost simultaneous appearance in every civilized country of the world, are also satisfactorily accounted for in the well understood vitality and subtle diffusion of the zoöspores thrown off into the atmosphere by this destructive fungus. The discovery of the fungus proved the fallacy of the popular theory, and destroyed the hope of resuscitating the plant from its original source of production, leaving science to cope with the disease itself.

But the origin of the disease is still vailed in mystery, and is a question open to much debate; especially when the existence of this fungus is made the basis of an argument in elucidating the doctrine of evolution of animals and plants, to prove that the forces which brought created matter into existence countless ages ago are still acting and forming new creations.

From this point of view the question of the true origin of the fungus becomes one of great speculative interest, and when associated with the doctrine of "spontaneous generation," of vital importance in the great modern antagonism of science and the Scriptures.

A late number of Hardwicke's *Science Gossip*, an English journal deservedly in favor with students and lovers of nature on this side of the Atlantic, contains the gist of a paper recently read before a learned society by Mr. Worthington Smith, in which he describes a remarkable fossil fungus belonging to the genus *Peronospora*, discovered by him, ramifying through the vascular structure of a *Lepidodendron*, one of the huge club-mosses of the Carboniferous epoch. This fossil fungus Mr. Smith names *Peronosporites antiquarius*, and regards it as perhaps the oldest fungus on record.

The paper is illustrated with microscopical views, enlarged to four hundred diameters, and showing with remarkable clearness the organization of the fossil oögonia (or zoösporangia), with the differentiation of the protoplasm into zoöspores as distinctly defined as in any living specimens of the present time; "and," says the writer, "the wonderful fact becomes manifest that the bladder is exactly the same in size and character with the average oögonia of the present day, especially with the same organisms belonging to *Peronospora infestans* when measured to the ten thousandth part of an inch. The average number of zoöspores in each oögonium is also the same. The organisms are apparently identical."

From the close alliance of the peronosporæ to the algæ, Mr. Smith infers the extreme antiquity of the *Peronosporites antiquarius*, and is inclined to place it among the primeval plants from which fungi and all other cellular cryptogams have branched.

The countless ages which have passed since this primordial fungus was mummified in the Carboniferous rocks, and the sudden appearance of the fungus in this age of the world, selecting for its habitat a plant that for three centuries has been under the constant surveillance of mankind, with all the logical inferences to be derived from this wonderful demonstration of nature, would seem to dwarf into absolute insignificance the recent experiments of Professor Tyndall, which lack the necessary element of time and the "environments" favoring a natural selection, which are concomitants of this greater experiment of Nature herself. Unless the wide gulf which separates our times from a geological period so remote that the "century" seems inadequate as a unit of measure, can be so bridged over as to show a reasonable possibility of regular descent, the burthen of the argument from which Professor Tyndall's neat and beautiful experiments were complacently supposed to have relieved the opponents of the doctrine of "spontaneous generation" still remains with them, and the conclusion of Mr. Worthington Smith stands unrefuted, "that the law which called the peronosporites into existence countless ages ago is in force now, and that this law produces the same results now as then."

J. W. PAGE.

Power Required to Run a Velocipede.

To the Editor of the Scientific American:

In your issue of February 9th G. O. A. asks: "Is there a practical bicycle made at present—that is, one which would enable a man of ordinary muscular development to travel a distance of 20 miles on a good country road in less time and with less fatigue than he could do it on foot?"

For some years past it has been necessary for me to use a velocipede as my only means of locomotion, and under the conditions asked by the above inquirer. I therefore do not hesitate to say that, on the strength of my practical experience, it is impossible to run a velocipede over a given distance in a given time with less expenditure of power than it would be to walk the distance in a given time.

In fact, under the most favorable circumstances, it is impossible to run a velocipede through a given distance with the same expenditure of power as that required to walk the given distance.

Who is it that would fail to see the absurdity of a person who on walking along a road had hitched himself (horse fashion) to a velocipede, with the vain idea that by drawing the vehicle after him he could more easily accomplish his journey? Certainly in the above instance he would have a better mechanical advantage than if he sat upon the machine and propelled himself, because the weight of his person would increase the friction of its moving parts.

Persons who perform great feats on velocipedes must practice continually, in order to keep their muscular powers trained up to the proper degree, as the force necessary to this end is greater than that required by the ordinary pedestrian.

JNO. B.

Antoine Cæsar Becquerel.

M. Antoine Cæsar Becquerel, the distinguished French physicist, recently died at the advanced age of ninety years. The cause of the electric currents which originate in the voltaic battery was unknown until Becquerel, by a series of brilliant researches, revealed the reason. He demonstrated that in the contact of the two metals there was no electricity disengaged, except in proportion to chemical action, friction, or difference in temperature; and on the other hand, he showed that electricity was produced in all chemical reactions, and especially in the action of acid on metal, the positive current passing on the metal and the negative in the acid. By investigating the chemical effects produced by the action of electric currents, even the weakest, M. Becquerel connected under the name of electro-chemistry a series of new phenomena, and showed the action of these in causing substances to be decomposed, combined, transported, crystallized, or made to produce brilliant colors used industrially.

During his study of thermo-electric phenomena, M. Becquerel invented the electric thermometer. By this instrument it is possible to determine at a distance the temperature of the interior parts of animals and vegetables, of the earth, or of the higher regions of the atmosphere. He also invented the differential galvanometer and the electro-magnetic balance. His more recent investigations relate to meteorological subjects and to certain curious electric phenomena, little understood, which occur in capillary spaces.

Henri Victor Regnault.

M. Henri Victor Regnault died in Paris, France, on January 19 last, at the age of sixty-seven years. M. Jamin sketches his life work, and pays a tribute to his memory in the following terms: "Regnault," he says, "collected all the fruits of the improvements he introduced into experimental art. Dulong before him had only perceived great general laws, and had not carried approximation far enough to discover their perturbations. Gases are not equally compressible; they do not dilate in equal ratios. Each has its individuality, and while all approach an ideal type expressed by Mariotte's law, none follow it absolutely. Regnault predicted that insufficiency of pressure was the sole obstacle to the liquefaction of oxygen and nitrogen, and that hydrogen itself, if it were cooled, would be capable of great compression and would liquefy. As Regnault advanced in his studies upon heat, difficulties multiplied. His researches in specific heat extend to all chemical bodies, simple and compound, solid, liquid, or gaseous, and Dulong's law came out victorious after the long test. The question of specific heat, already vast and difficult in its relation to solids and liquids, becomes still more complicated in relation to gases. The latter may be heated without change of pressure or volume, and in each case admit a different specific heat. Moreover, the relation of these heats is connected with the velocity of sound. Hence the utility may be conceived of measuring at once both these specific heats and the velocity of sound. It was necessary to do this for all gases, an immense work which Regnault did not hesitate to undertake, despite a severe accident which rendered the task the more difficult. He accomplished his undertaking, but was left with enfeebled mind—paying the penalty of overworked genius, as Newton and Pascal had done before.

"Regnault took little part in the advancement of the modern thermo-dynamical theory, for his labors rarely proceeded beyond the limit of experiment. Nevertheless, through his work the great theory has obtained many of its strongest arguments. It is the crowning of the edifice, and it appears that in that, scientific progress has been directed by a providential logic which first collected and classified facts, the causes of which were afterwards sought for. This classification was Regnault's life work."

Father Secchi.

Father Pietro Angelo Secchi, one of the most noted and successful of European astronomers, died in Rome on February 26. Father Secchi was born in 1818, and in 1850 became director of the Observatory of the Roman College. Here he invented a plan of meteorological observations, completed a survey of the Papal States, and conducted a water supply into Rome. He was the author of numerous valuable astronomical works, and was specially distinguished for his discoveries in spectroscopic analysis and in solar and stellar physics.

Claude Bernard.

M. Claude Bernard, who died on February 10, was one of the most famous of modern physiologists. He was the first who fully demonstrated the processes of digestion, and proved that the pancreatic juice is the agent which digests fatty substances; and that the blood on entering the liver possesses no sugar, but has an abundance on leaving it, a discovery since turned to great account in the treatment of diabetes. He died at the age of sixty-five years.