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AMERICAN FORESTRY ASSOCIATION.

By the invitation of the citizens of Brooklyn the American Forestry Association held its meetings there at about the same time as the other scientific bodies that have been assembled. It was opened by an illustrated lecture by Mr. B. E. Fernow, chief of the Forestry Division of the Department of Agriculture. The title was attractive and suggestive: "The Battle of the Forest."

Mr. Fernow claimed that the earth is a potential forest, which if left to itself would occupy the globe. He described the development of arborescent flora through the past geologic ages. The manner was explained by which the soils were prepared by other forms of vegetation, as well as the pioneer work of certain trees, like the mangrove and bald cypress, which turn water into dry land. The first struggle is between the species themselves for light, which is only secondary to soil as an essential of tree growth. What men style "the virgin forest" is really the product of long contests that may have lasted for thousands of years.

Man's part in the battle was described by word and picture. Twelve views from the French Alps showed how, by ax and fire, over a million acres had been laid bare and eight millions ruined by the detritus thus produced. More than $40,000,000 have been spent thus far, and four times that much will be needed, to restore the damage thus heedlessly wrought. A small sum spent in protecting the community at large against individual greed would have saved the equivalent of a great revenue. Similar dangers threaten our own land. Ten per cent of the Mississippi uplands have been ruined during the last twenty-five years by the foolish removal of the forests.

The unskillful methods of the lumberman were next criticised. By culling the best species, regardless of the aftergrowth, the future value of the forest is reduced. Intelligent forestry, while using the timber crop, substitutes artificial for natural protection, thus assuring the survival of the most useful. The case of a German spruce forest was cited that contained ten times as much useful material as did the virgin forest. With this was contrasted the destruction wrought in the Adirondacks by fire, water stowage, and wrong methods of lumbering. The State should interfere; for private owners do not seem to care for the future generations. The State should own and manage its woods, and should exercise supervision over private lands to see that the whole community does not suffer from the destructive policy of greedy men. This cannot be done by such "rules of thumb" as a restriction of cutting trees of less than a given diameter, nor can the legislator tell the forest how to grow. He might as well try to legislate on the proportions of an arch. But he can encourage the skill of professionally trained foresters, instead of leaving the woodland in the hands of careless woodchoppers. The problem of saving and rightly using the forests should be treated as a business matter, to be settled intelligently, like other problems demanding wisdom, common sense, and a certain degree of business capacity.

Meetings of the Forestry Association were held for reading and discussing papers on Wednesday, August 22, in the Packer Institute, at which Hon. George W. Minier presided. Hon. J. C. Chapain, an accredited representative of the Department of Agriculture of Quebec, was introduced and spoke on the forestry of Canada. Prof. W. H. Dall read a paper on "The Forests of Alaska," dividing the Territory into three regions. The northern part is mainly composed of tundra covered with grass and moss; the middle portion is sparsely wooded with spruce, poplar, and birch; the southern part consists largely of islands with no trees except such as have been planted during the last hundred years. The heavy winds cause this prevailing treelessness, as is proved by the forest resources developed in the southeast, where the lands are protected by mountain ranges. The country south of Cook's Inlet is densely wooded with cedar, hemlock, spruce, poplar, and willow. Very little timber has yet been cut, and the forests are mainly in their natural condition.

Dr. H. C. Hovey gave an account of the vast petrified forests of Arizona, describing their origin, mode of petrifaction, and present condition. They are the remains of a forest of gigantic pines and cedars that once covered thousands of square miles. Inundated by floods of silicious waters, the woody cells were replaced by particles of silex, often stained brilliantly by ores of iron or manganese. Prostrated by earthquakes, the trunks and branches were fractured in every conceivable way, and then embedded in lava sand, some of which remains as a soft kind of sandstone, while mostly it has been removed by the elements. The visitor to this enchanted region sees a million tons of gems in sight, agates, carnelians, jaspers, onyxes, and amethysts. Many carloads of these precious stones have been removed to be polished or otherwise disposed of. The latest news is that these gems are now being pulverized, to be used for purposes similar to those now met by emery. Views were thrown on the screen and specimens, polished and in the rough, were exhibited. Microscopic slides were produced showing the cellular structure of the wood. A plea was made for the governmental protection of this wonderful region, which is now so rapidly being destroyed.

Prof. G. C. Smock read a paper on "The Forests of New Jersey." The urgent need of State regulations to promote tree culture is acknowledged by the farmers. Along the Kittatiny Mountains deforestation has progressed to an alarming extent. It manifestly affects the water supply. The commercial value of the pineries as sanitariums, like that at Lakewood, was suggested.

Mr. Verplanck Colvin, superintendent of the Adirondack Survey, read a paper giving an account of the region indicated, advocating the State Park, advising the entire non-use of the Alpine regions, on whose preservation the water supply depends, and recommending forestry experiments to restore the over-lumbered districts.

Gen. G. C. Andrews, of Minnesota, showed that forest fires cost the United States $25,000,000 annually. He cited European countries which manage to prevent such fires. We can never do so in this country until our forests are patroled and watched by men employed for that purpose. The public forests of Europe yield a steady net income of four per cent, and we might profit by borrowing some of their well-tried regulations.

As the outcome of the foregoing discussions the following resolution was unanimously adopted: That we approve of the enactment of laws, not only for the care and protection of the timber and other resources in the forest reservations, and on all public timber lands, but also for their rational use. The policy of reserving can hardly be an advantage unless followed by an intelligent administration of the reservations. This Association denies that it advocates the exclusion of large territories from actual use, and affirms that the reservations are for a rational use under proper restrictions. We therefore desire to impress on our representatives in Congress the urgency of making provisions for the better care of our public timber and other forest resources.

The Association, by invitation of the New Hampshire Forestry Commission, held a midsummer meeting after its Brooklyn session and spent several days in exploring the White Mountains. This was not merely to view the noble scenery, but also and particularly to inspect the sawmills, lumber yards, and general lumbering operations of New Hampshire. Mr. G. B. James, editor of the American Cultivator, gave an outline of his plan for preserving the woods of the mountains. The Appalachian Mountain Club also spoke of their unique work. There were other interesting lectures and addresses during the evenings of the excursion; and the result was to add greatly to the enthusiasm and interest of those who joined in the meetings.

THE MAGNITUDE OF THE SOLAR SYSTEM.

It is the custom for the retiring president of the A. A. A. S. to give an elaborate address of considerable length, either on some topic or general interest to scientific people or on some special subject belonging to his own department of research. There are certain advantages in the latter plan; but among the objections to it may be mentioned the fact that every specialist is liable to use terms entirely familiar to himself and men of his class, but which may require some explanation for the comprehension of men in other walks of science. Possibly if Prof. William Harkness had taken the pains to explain some of the terms used in his admirable address on the Magnitude of the Solar System, it would have added to the interest taken in it by some of his hearers.

After reviewing the history of astronomy from the days of Pythagoras, Ptolemy and Aristarchus, through the era of Copernicus, Newton, Kepler and Halley, down to our own times, the speaker summed up concisely the methods and results involved in the solar parallax. First among these are the observations made of the transits of Venus, the opposition of Mars, and those of certain asteroids. Then follows the lunar parallax, as found directly and from the study of the force of gravitation at the earth's surface. The constants of precession, nutation and aberration must be obtained from observations of the stars. We must consider the parallactic inequality of the moon; the lunar inequality of the earth; the mass of the earth found from the solar parallax and also from the periodic and secular perturbations of Venus and Mars; the mass of the moon; the masses of all the planets and their satellites; the velocity of light, as obtained by experiments with toothed wheels and reflecting mirrors, together with laboratory determinations of the index of refraction of the air; the light equation obtained from the observation of Jupiter's satellites; the figure of the earth obtained from geodetic triangulations, variations in the pendulum, and the perturbations of the moon; the mean, surface and interior density of the earth.

This large group of astronomical, geodetic, geological and physical quantities must all be considered in finding the solar parallax. And it should be remarked **that these are so entangled with each other that no** one of them can be varied without affecting all the rest. It has hitherto been the custon to consider them apart; but henceforth we must determine them simultaneously.

It was to this conclusion that the speaker seemed desirous to lead his hearers through the long array of facts presented. His illustration was very felicitous. It is well known that, in geodesy, when a country is covered with a network of triangles, it is assumed that every observed angle is subject to a small correction. And as they are all entangled together in the network, they are all determined simultaneously, by an ingenious application of the method of least squares, and in such a way as to satisfy the whole of the geometric conditions. The omission of this method in any important triangulation would prove the incompetency of those having the work in charge. Like these triangles, the quantities composing the group from which the solar parallax must be determined are all subject to error, and their corrections must be so determined as to make the sum of their weighted squares a minimum, and at the same time satisfy all the equations. The main reasons why we have not availed ourselves of this method before are, first, the habit we have of overestimating our own work as compared with that of others, and secondly, our unfortunate tendency to too much specialization.

The prevailing opinion certainly is that great advances have recently been made in astronomy; and so they have in the fields of spectral analysis and in the measurements of minute quantities of radiant heat. But the solution of most astronomical problems depends on the exact measurement of angles; and in that little progress has been made. Bradley with his zenith sector, 150 years ago, and Bessel and Struve with their circles and transit instruments, 70 years ago, made observations not inferior to those of the present day. The only way in which we have improved on the telescopes made by Dolland, 130 years ago, is by increasing their aperture and relatively diminishing their focal distance. The most famous dividing engine in existance was made by Repsold 75 years ago. Only in the matter of clocks has there been any advance, and even that is not so very great. The star places of to-day are a little better than those of 75 years ago; but there is room for improvement.

Our vaunted modern instruments gave little better results for the transits of 1874 and 1882 than were had with much cruder appliances in 1761 and 1769, and whose discordance was notorious. We know that the limit of possible accuracy with any instrument is soon reached; and yet a certain fascination lures us on in our efforts to get better results. From every series of observations there always remains a residuum of error which gives us trouble.

Encke's value of the solar parallax was obtained trigonometrically, and it was never suspected till its inaccuracy was revealed by gravitational methods, which were themselves in error about one-tenth of a second, and needed to be corrected in other ways. The constant errors of any one method are accidental errors to all others, and the way to eliminate them is by combining the results from as many different methods as possible. Why ignore the work of predecessors who were quite as able as ourselves? There is no exaggeration in saying that the trustworthy observations now on record for the determination of the numerous quantities which are functions of the parallax could not be duplicated by the most industrious astronomer working continuously for 1,000 years? These observations are probably as exact as any that can ever be made unless we can invent vastly superior instruments to any yet made. To free them from constant errors we have only to form a system of simultaneous equations and deduce the most probable values by the method of least squares. With almost any possible system of weights the solar parallax will come out very nearly 8·809 seconds X 0·0057 second; whence we have for the mean distance between the earth and sun, 92,797,000 miles, with a probable error of only 59,700 miles; and for the diameter of the solar system, measured to its outermost member, the planet Neptune, 5,578,400,000 miles.

The Antwerp Universal Exhibition.

[FROM A SPECIAL CORRESPONDENT OF THE SCIENTIFIC AMERICAN NOW AT ANTWERP.]

A correspondent of one of the Berlin daily newspapers writing from Antwerp, and comparing this Exposition with the one in Chicago, says, in substance, that the display there was the greatest and the most beautiful that mankind has ever produced, but it was too majestic to be "amusant." In this respect the Antwerp Fair is superior. This writer would probably want to have "amusant" translated amusing rather than entertaining, for he goes on to say how little faculty the Americans, especially the Chicago man, has for being amused.

This Antwerp Exhibition is certainly not majestic; it does not give one the inspiration and instruction to be gained in Chicago, neither does it give the exhaustion to mind and body, nor the despair of ever being able to see more than a small fraction of what has been brought together. This Antwerp Fair is quite within grasp, as well as amusing; it is a wonderful illustration of pluck, too! What can you call it but pluck, when a country, not as large as Massachusetts and Connecticut together, with only 5,000,000 of inhabitants, most of them poor, undertakes the very next year after the greatest exhibition ever seen to have one, and sublimely calls it a "Universal Exhibition"?

It occupies a very historic place, the site of the old south citadel, built by the Duke of Alva, and includes the adjoining part of the town, embracing within the grounds the Museum or Palais des Beaux Arts. These 100 acres lie in the southwestern part of the city, and are easy of access by omnibuses and street cars.

This is the annual week of fetes, Wednesday being Assumption day, and crowds have poured into Antwerp, so that the entrances to the Fair are dangerous places at some hours. Whether from a desire to be amused or from innate roughness, I do not pretend to say, but the crowd is a pushing, ugly one; fists and elbows are freely used. The SCIENTIFIC AMERICAN has printed a good picture of the front of the building in which the exhibits are.* It is of wood, absolutely plain, except in front. That has a good deal of ornamentation, in paint and relief, with a large dome in the center to light the rotunda. The effect of the whole is rather pleasing. Passing through this main entrance, we are at once in Belgium's own department, which occupies the largest section devoted to a single country. And a brave showing she makes, too, of her arts and industries. The pavilion directly in front of the door is in the interest of the Vielle-Montagne zinc mines, showing a wide range of uses for this metal. Within is a model of the pavilion itself, made entirely of plates of zinc; at the base are two spirited statuettes in imitation of bronze, and just as pretty, for aught that I can see, as bronze. On the sides are models of houses roofed with zinc; some of the plates are like pointed shingles, others are in corrugated strips. A model of a boat has its keel sheathed with zinc, and large sheets for that purpose lie here, along with coils of wire and cards of nails of every size. Plates for electric batteries and pails of paint show the common uses. But the application of the metal of special interest is for the prevention of the accumulation of sediment or oxidation in steam boilers. This is illustrated by a section of a boiler with what looks like a plate of zinc, measuring about 4 × 6 inches, fastened in the center. From a printed sheet on the model, I take the following: "Two years ago, one of the accidents which lead to discovery brought to light the superiority of zinc over other substances called tartriques, generally employed to prevent sedimentary deposits—the principal cause of boiler explosions. One of the machinists of the St. Laurent, a transatlantic packet, having forgotten when he left Havre an ingot of zinc of a certain weight, inside one of the boilers of the boat, was surprised when he next examined the generator not only to find no deposit adhering, but also to find no trace of the ingot he had left. This fact having been brought to the knowledge of the public by industrial papers, experiments were made in different places, and notably by the Vielle-Montagne Company, to ascertain the value of this new preventive of incrustation. These trials have given very good results."

The Vielle-Montagne has taken from one of its boilers the ingot which is exhibited. This ingot has been in the generator six months; it has lost a part of its weight and, preserving its form perfectly, has been transformed into a spongy, pulverulent mass. The phenomenon of this transformation of zinc is attributed to a thermo-electric current which is produced within the boiler. Indeed, two metals are together here, the iron and zinc, one negative, the other positive, which constitute the two poles of a pile. It is probable that the electric phenomenon preventing the formation of incrustations is analogous to that produced in the hulls of ships sheathed with zinc. It has been found by recent experiments that the proportion of zinc to use is 20 kilogrammes for 100 horse power steamers for a three months' voyage. It seems that both the German and English governments use these plates in the boilers of their ships, the consumption annually of the latter being 800,000 kilogrammes of zinc. The Vielle-Montagne Company had its first mines and factory near Liege, but within the last few years has establishments in France as well as Belgium. As a part of its exhibit it shows a model of the village near Liege, where it has an asylum for old workmen. It consists of a number of buildings, including a church, and has pretty terraced grounds about it.

Models of this kind are numerous in the exhibition, and generally give a very satisfactory idea of what they represent. For instance the porphyry quarries at Quenast, Belgium, are thus shown on a large scale; the various strata in each quarry, the tracks and trucks for moving the stone, houses of the workmen, etc. The glass manufacturers of the country have combined to make a unit of their display with very good effect. The most beautiful work has been done by the Val-St. Lambert Company; its old works, established in 1825, are at a town of that name, near Liege; of the other three factories, two are near Namur, and the fourth, started in 1882, is also not far from Liege. The annual product of these factories is valued at $1,500,000, and the workmen number 4,500. The ware is of the most exquisite quality, in form, cutting and chasing.

* See SCIENTIFIC AMERICAN of June 16, 1894.

Beyond the glass comes a large display of porcelain made by Boch Freres, at La Louviere. There is an almost numberless variety of designs and dishes in this display; all of them are heavy and much ornamented; some bear a general resemblance to the blue Delft ware, and others much like the English Doulton. There are large plates in blue and white, with beautiful pictures in the center—far too good for anything but ornament, they are. It would be like having a fine canvas injured to have one broken. The most ambitious exhibit made by this firm is shown in a separate alcove, where upon the wall there are beautiful pictures composed of their tiles. The largest of them is a woodland scene; there are mountains in the distance, a lake in the foreground, and stags hunted by Diana, I suppose, and her maidens. It is wall decoration which would be a source of much pleasure wherever it was appropriate.

Brussels has, of course, a large showing of lace, some of it about as fine as a spider's web. It was while looking at a case of this, in which most dainty painting on white silk or satin is combined with lace to form parasols and fans, that I first noticed the word "Lotterie" attached to one piece marked $1,000, and to another marked $4,000. I have since seen objects labeled the same way all over the building, and learn that the government has authorized the sale of all these things by chances, and undertakes to see that the drawings, which take place at three different times, are conducted honestly. Gambling has been suppressed at Spa, to the honor of the country be it said, but why it is any better to conduct it officially at this exhibition, it is not easy to understand.

A Liege company makes a conspicuous display of large and high iron tubes used to conduct water and gas and has printed on the pipes the alphabetic lists of places where they have been supplied. It is interesting to know how many and distant lands look to this little one for this and other kinds of supplies.

Not only are the pipes in use in Spain, Russia, and Italy, but in the Antilles, Mexico, and the large cities of South America. Tubes for fountains are an important part of the business; a picture is shown of one, apparently of magnificent size, put up in Bucharest. It forms a broad cascade, in which there are two grottos containing figures.

As might be expected, the coal industry of Belgium makes an important exhibit. The coal is bituminous and very friable; specimens of it in large masses and small are shown by many companies, but the most interesting, because most novel, forms are what are called "briquettes," "boulets," and "ovoids." These are pulverized pressed coal, arranged in pyramids and other shapes. The "briquettes" vary in size from blocks about 6 inches square and 1½ inches thick to those as large as three common building bricks; the "boulets" and "ovoids" are in size and shape like cakes of toilet soap. A great business is now done in grinding coal and then pressing it; and apparatus used for the purpose is here. One machine consists of a large half cylinder of iron, with strong projections besetting the inside longitudinally; between these, an iron pestle, with like projections, works up and down, thus crushing the coal. A new machine made by Allard Freres, at Chatelineau, Belgium, consists of iron cylinders closely covered with pyramidal teeth about an inch high, connected with shafting so as to revolve upon each other and crush the coal. An apparatus with such cylinders does the first breaking, and one with four makes it fine enough to press. Before this is done, the pulverized coal is washed in an apparatus shown. Then the dust is put into another machine which has a hopper at the top to receive it, and falls upon a wheel covered with moulds of the size of the "boulets" and "ovoids," for both are made together, and by the revolution of other wheels upon the moulds, sufficient pressure is given to make the powder adhere. I saw no apparatus for the "briquettes." An engine of 10 horse power, I was told, is used for the washing and pressing processes. The only man who could give me any information about this pressing process said that the advantages to be derived from it are the elimination of earthy matter from the coal, the freedom from dust of the forms and their lasting longer in the fire. A very compact electric locomotive of 3 horse power, inclosed in a wooden sectional case, labeled Julien System, is used to draw the coal in a mine at Jumet. It looks to me like a vast improvement over mule power. A firm at Charleroi show an artistically arranged case of coal products which they manufacture, including lavender, rose, and yellow naphthaline in powder, and the white in flakes, balls, and other forms; they also show tar and various grades of oils.

(To be continued.)