Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS

One copy, one year, for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year.
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Edition (Established 1885). ..... 2.50 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, JULY 7, 1900.

AN UNFORTUNATE COMPROMISE.

It is greatly to be regretted that the naval authorities should have compromised on the question of superposed turrets by deciding to build three of our new battleships with such turrets and two without them. Thecompromiseis suggestive of indecision or uncertainty, or at least of lack of harmony on a question which has surely been long enough in debate and on trial to afford ground for definite action. We have the "Oregon" and the "Iowa" as representatives of one type, and the "Kearsarge" and "Kentucky" of the other, and surely by this time the officers of the line and staff have sufficient technical data and sufficient "sweet reasonableness" at command, to be able to get together and decide definitely which type to adopt.

As the matter now stands, there is every reason why a unanimous vote should be given—for the staff, in the person of the naval constructors, have stated that there is no structural objection to the turrets, and the line, in the person of the captains and admirals who fight the ships, are agreed that there is every military reason why they should be adopted. Being thus approved on both structural and military grounds by the experts who are severally qualified to speak from these points of view, where, the puzzled layman will ask, is the bone of contention?

We understand that the last word has yet to be spoken and the last vote taken on this question; and hence there will be an opportunity for the department to reconsider its recent regrettable decision, and commit itself to one type or the other by a unanimous vote.

GARBAGE DISPOSAL OF NEW YORK CITY.

Without entering into the merits of the controversy regarding the Barren Island reduction works, there is no denying that the recent action of the state officials in forbidding the reduction of garbage on the island by the present methods will bring this city face to face with a very serious problem.

In spite of the offensive odors which prompted the recent complaint from the residents in the neighborhood of the reduction works, there is no question that the plant did get rid of an enormous amount of organic refuse, which must otherwise have been left upon the hands of the Street Cleaning Department. Recent figures state that every year 150,000 tons of swill alone, not to mention other forms of refuse, have to be disposed of in some manner consistent with the public health. It will be a decided step backward if the material, which at present is rendered innocuous at Barren Island, were to be added to the garbage which is taken out on scows and dumped into the sea outside the harbor. Such a step would seem to postpone indefinitely the time for which we have all been hoping, when this primitiveand, we almost said, disgraceful way of disposing of the city's wastes will be entirely abolished. The miscellaneous rubbish which strews the shores of New Jersey and Long Island, and spreads its disgusting fringe over the various beaches of the lower bay, bears painful witness to the fact that this great city has never yet grappled seriously and scientifically with the problem of garbage disposal.

The foregoing statement is made with full knowledge of the fact that a spasmodic and incomplete attempt was made a few years ago to get rid of a portion of the city's wastes by a method of sorting and burning. While every credit is due to the late Colonel Waring for putting up this experimental plant, it seems that the scheme was inaugurated on too small a scale, and was subsequently too heavily handicapped by political drawbacks, to afford very reliable data as to the cost and efficiency of the process.

Whatever method is to be pursued in the immediate future, it is certain that before long New York must cease to throw its rubbish into the sea and devise some less primitive method. Obviously the first step should be the appointment of an expert commission to go thoroughly into the whole question of garbage disposal, examine the plants installed in various great cities, both here and abroad, and determine upon a system which would best meet the local conditions in New York city.

RELATION BETWEEN TRANSVERSE AND CRUSHING STRENGTH OF TIMBER.

One can scarcely overestimate the value of the elaborate timber investigations planned and carried on by Dr. Fernow as Chief of the Division of Forestry. For many years there has been a great demand for more accurate data respecting the strength of timber, especially when used for heavy structural work. The text books, it is true, have provided tables which are based upon more or less careful investigations; but there is so much divergence between the different authorities, and there are so many varieties of timber, the data regarding whose strength is based upon imperfect experiments, that there has been a pressing necessity for a more comprehensive and scientific investigation.

There is no country where the possibilities of timber as a structural material for heavy engineering work have been more clearly demonstrated than in the United States; and although mild structural steel has displaced timber in many branches of engineering and architecture, timber is still used, and will continue to be used, extensively in many important lines of work for years to come.

One of the most important results of the present timber investigations is the discovery of the relation between the strength of a beam and of a column of the same material, which relation has been deduced and mathematically developed from the many thousand tests made during the extended general test series. During the present winter tests carried out under the auspices of Prof. Roth, of the New York State College of Forestry, furnished experimental proof of the correctness of this relation, which is, that the strength of a beam at the elastic limit is equal to the strength of the material in endwise compression. That is to say, in order to determine what load a beam will carry without injury to its elastic properties, it is sufficient to test the material in compression to the point of failure. The load under which failure occurs is also the breaking load for a beam strained to the elastic limit. The practical value of this discovery is evident; for a simple test in compression gives, without the introduction of difficult formula, immediate answer to the important question of the strength of beam to safe limits. These tests, which were carried out by Prof. C. A. Martin and Mr. George Young, Jr., of Cornell University, removed any doubt as to whether wood possesses a definite elastic limit; which limit, although it is less pronounced in wood than it is in metals, is, nevertheless, readily recognized.

WIRELESS TELEGRAPHY IN SOUTH AFRICA.

The recent visit of Marconi to this country has, in some measure, revived the interest in his system of wireless telegraphy which was aroused during the memorable international yacht races of last summer. We learn that at the outbreak of the South African war an opportunity was presented for dispatching several of Marconi's assistants, and that they took with them complete outfits of wireless telegraphy instruments. It seems that at the outset of hostilities, the capabilities of wireless telegraphy, which were so readily appreciated by the naval authorities, did not seem to commend themselves to the commanders in the field. Instruments had been sent to Generals Buller, White and Methuen; but they failed to develop the plant, and seemed to have looked askance at the new invention, preferring to rely upon the old time heliograph and searchlight signals. In besieged Ladysmith communication was established by means of balloon, by electric signals thrown on the clouds, by heliograph, and even by homing pigeons; but no mention is made at any time of the use of wireless telegraphy, either by the forces in Ladysmith, or by the relief columns under Buller.

There were some generals, however, who gave the system a fair test, and it is characteristic of Lord Roberts that immediately upon assuming command in South Africa he appointed several experts in wireless telegraphy to accompany him. There have been ten instruments in Lord Roberts'army, and the operators have been given every facility to test the system. Little is known as to their practical working, except that it has been in the main satisfactory. The report which will ultimately be given will, no doubt, throw favorable light upon the practical value of wireless telegraphy in land operations. It is worthy of note that the difficulty of providing the necessary elevation for the vertical wire was met by making use of the form of kite designed by Baden-Powell, the brother of the defender of Mafeking.

RECENT DISCOVERIES IN CORINTH.

Four foreign countries, Germany, France, England and the United States, now have schools at Athens. Germany was the pioneer, and the others followed her lead. The United States has one building, and this year there are thirteen students, the largest number in the history of the school. Twenty-three colleges contribute to its support. There is a director, who is selected for a period of four years, and each year he is assisted by a professor who lectures on special subjects. Prof. Rufus B. Richardson, of Dartmouth College, has been director for the last eight years, and under his care the school has distinguished itself by its explorations at Corinth. Six of the students are women, and during the war with Turkey one of them served as a nurse. The school closes about the end of May, when it becomes too warm in Athens for regular work. Some of the students go to Corinth with Prof. Richardson, where they rent a house in the village and push the work of excavation as far as their means will permit.

This year's work at Corinth has been specially devoted to the finding of many small but important objects. It will be remembered that in three campaigns, one important building after another has been excavated, until at last the explorers found themselves inside the Agora. The establishment of the topography of such an important site was a brilliant success. This year they turned the west flank of the Propylæa, and they soon found the way blocked by marble blocks and statues. The first two statues found were a pair of colossal figures 8 feet high, wearing the Phrygian cap, attached to pilasters at the back. Two Corinthian square capitals fitted on to the tops of these pilasters. The figures appeared to assist in bearing at least the architrave, and they were analogous to the famous Caryatides. Two square bases which were also found fitted the figures. This enabled the whole system to be reconstructed from the bottom up.

There were also discovered various fragments of statues, including a very fine head of Ariadne. The crowning success of the year was the discovery made about 75 feet southwest of the western end of the Propylæa, when the explorers came upon the platform 3 feet high with a façade made of metopes and triglyphs, and a coping above them with red, blue and yellow paint still covering them, making a gorgeous show. The façade had a length of about 30 feet and for a part of its extent it had no platform behind and was simply a balustrade. At a bottom of a flight of seven steps was an irregularly shaped room about 25 feet below the surface. In the western wall of the room there were two bronze lions' heads, through the wide open mouths of which water once flowed. Beneath were round holes in the pavements in which pitchers were placed for filling. Prof. Richardson considers, says The Evening Post, that the fountain which the party discovered is an ancient Greek fountain and an absolute unique example. A guard is now mounted over it to prevent its being mutilated. The balustrade at the top of the steps is believed to be Roman in the sense that it was placed there when Corinth was refounded by Julius Cæsar, but it is Greek, and very interesting Greek, because it was taken from the temples which Mummius destroyed.

QUARTZ THERMOMETERS.

M. Dufour gives an account to the Academie des Sciences of a series of experiments which he has made regarding the use of quartz for thermometers and other instruments. As quartz may be softened in the oxyhydrogen blowpipe, and may then be worked like glass, he was able to make tubes of quartz, and afterward thermometers of the same material. Quartz may be applied to the construction of various apparatus, and may be of service; first, where a transparent substance and one not easily melted is required; secondly, where a transparent envelop of definite composition, but slightly affected by hygrometric conditions is called for. The first of these conditions is realized by the quartz thermometer, which consists of a reservoir of quartz and a tube of the same material. As for the liquid, it must be a body which it is easy to obtain in the pure state, and which melts at a relatively low temperature, giving off no vapors up to a red heat; moreover it should contract on solidifying. He finds that tin answers perfectly these conditions, and has constructed a thermometer, using tin as a metal, which reads from 240° to 580° C. As quartz softens only at 1,000° to 1,200°, a thermometer may be made which reads up to 900°; it can be graduated by utilizing the boiling points of mercury and sulphur and the level of the tin is well defined in the two cases. To go higher, the boiling points of cadmium and zinc may be taken. The thermometer was filled with melted tin and as perfect a vacuum as possible was obtained, after which the end was closed by the blowpipe. The last bubbles of air were taken out by melting the tin, while giving it repeated shocks. If the tin has traces of oxide, this adheres to the sides of the reservoir and remains fixed. The upper surface is always brilliant, and has the same appearance as mercury. The reservoir should have rather thick walls to avoid rupture when the metal cools.

M. Dufour hopes that quartz may supersede glass in the construction of vacuum tubes for spectroscope work; he observes that when a glass rod is melted in the oxyhydrogen blowpipe flame there is a disengagement of gas, which is due either to a reaction which is completed at this high temperature, or to the evolution of gases which have been previously dissolved in the glass; on the other hand, quartz melts quietly and no gas is given off. In experiments with spectroscopic tubes, difficulties are met with which

seem to be due to gases given off by the glass; it may be supposed that the use of quartz will remedy these, and as it is a body of definite composition, not oxydized, reduced with difficulty, but little hygrometric and dielectric, it will be seen that it could be used to advantage for making spectroscope tubes. M. Dufour is now making a hydrogen tube of quartz, and expects it to give a perfect spectrum; if so, he will utilize it in establishing a theory of vacuum tube phenomena.

MUIR GLACIER DESTROYED.

The SCIENTIFIC AMERICAN of December 23, 1899, in an account of the great Alaska earthquake of September 10, conveyed intelligence of the probable destruction of the fore part of the Muir as well as all the other glaciers having their outlets on Glacier Bay. The excursion steamer "Queen," on its first trip of the season to this locality, confirmed the correctness of the information published. All of the glaciers fronting on the bay, as well as those of Taku Inlet and Disenchantment Bay, have been shattered by the great earth waves of September, and their sea ramparts cast into the waves by the tremendous shock. The Muir being the greatest as well as the most accessible of the Alaska glaciers, is on that account best known. It has been carefully surveyed and its dimensions approximately estimated. Its main channel extends back into the country for fifty miles and it has forty lateral branches.

At the sea it presents a front two miles long and rises in places 250 feet above the tide. Soundings indicate a depth of 720 feet below, and, therefore, a total height from base of nearly 1,000 feet. Its advance seaward is at the rate of 2,000 feet a year, and every day it is estimated that 200,000,000 cubic feet of ice drops from its face into the sea. Ordinarily a steamer may approach within a mile, but great caution is necessary, as huge icebergs are continually breaking off the sea face, and a vessel once struck by these great masses would be liable to serious damage.

The "Queen" in its recent trip first encountered vast floes of ice about 50 miles distant from Glacier Bay. Continuing to the entrance of the bay, which is 35 miles long and 10 miles wide, the progress of the steamer was greatly impeded by icebergs of most fantastic form, which covered the whole surface. By cautious navigating the "Queen" was enabled to make its way to a point five miles distant from Muir Glacier, where further progress was impossible owing to the packed ice. With the aid of a glass the whole front of the glacier was seen to have been shattered. The familiar palisades had vanished. The wave of the earthquake had leveled the icy rampart to the sea level. The whole aspect of the scene had been changed almost beyond recognition.

The extent of the catastrophe will not be ascertained, perhaps, for years. Until the ice disappears from Glacier Bay, navigation to the foot of the glacier cannot be resumed. Probably one or more seasons may have elapsed before the mightiest natural object of Alaska scenery will be accessible to the view of the tourist.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

A delightful and profitable meeting of the A. A. A. S. was held in New York city from June 23 to June 30, with several hundred fellows and members in attend ance, and a long list of papers and addresses on a host of scientific topics. The headquarters of the Council were at the Hotel Majestic near Central Park; and those of the association were at the Columbia University, whose halls, libraries and laboratories were open for the use of the visitors. The anniversary meeting on the evening of Tuesday, June 26, was in the lecture room of the American Museum of Natural History, followed by an informal reception. The New York Aquarium, Botanical Garden, Zoological Park, and various educational institutions were made accessible for the members of the association.

Certain innovations were noted, some of them for the better, and others experimental and of doubtful advantage. Usually, the annual meeting occurs late in August, but was changed to June this year to accommodate those who were likely to go abroad to the international and scientific congresses to be convened in connection with the Paris Exposition. This, however, is not regarded as a precedent, but an exceptional case. Another innovation was the omission of the long-continued custom of inviting some bishop, or other eminent clergyman, to open the first session of each annual meeting by prayer. Quite possibly this opportunity has at times been misused, but this could be avoided by selecting men who were known to be in sympathy with scientific progress. Still another innovation widely commented on was the intentional omission of popular lectures, entertainments, social functions and extended excursions, for which these annual gatherings have hitherto been remarkable. Here again abuses may have crept in, whose correction was a delicate and difficult task; but the question arises if the remedy employed has not been too drastic and extreme. Quite commendable is the novelty of so adjusting the delivery of the nine vice-presidential addresses as to have them given on retiring from office instead of on assuming it, thus conforming to the usage concerning the presidential address.

The most radical departure of all from former usage is the decision to ask no favors of the citizens of the place where the association assembles, but to act independently as to time, place and conditions of meeting. This, of course would simplify matters; but the question arises if it would not diminish the public interest in the transactions.

Concerning all things it would seem that the test is the Constitution itself, which avows as the objects for which the organization exists, "to promote intercourse between those who are cultivating science in different parts of America, to give a stronger and more general impulse and more systematic direction to scientific research, and to procure for the labors of scientific men increased facilities and a wider usefulness." If the innovations noted will promote these ends, they are desirable. But the tendency seems to be to narrow the practical work of the association to the wants and tastes of professionally scientific men, instead of promoting the "advancement of science" among those who are in the ordinary walks of life, and yet have a genuine interest in scientific research. Some of the most princely donors to scientific institutions and organizations are persons who would lay no claim to more than a deep and strong admiration for the researches they seek to promote.

Scanning the columns of the daily press, we find scanty reports of the transactions of the association; and scanning the audiences before whom the addresses and papers were delivered, we saw only a few who did not wear the pretty white button indicating membership in the scientific body, or some insignia of the affiliated societies. Few local residents aside from these were present when Prof. Woodward was installed as president, and when President Seth Low, of the university, welcomed the delegates. We had looked for a popular audience to crowd the lecture hall of the American Museum of Natural History when Prof. Grove K. Gilbert, of the National Geological Survey, gave his remarkably lucid and helpful presidential address on "Rhythmic and Geologic Time;" but those present were almost without exception professional scientists. The citizens as such did not attend, nor were they expected, nor had they been invited to do so. We are by no means in a fault-finding mood; but we deem it a duty, as friends of the many thousands who take a deep interest in science, without claiming to be experts, to enter our respectful protest against what seems to be a radical departure from the original and constitutional aims of the association.

There were enrolled about 500 fellows and members, which was a falling-off from the attendance in some of the smaller and interior cities. The list of papers was also smaller than usual. But, on the other hand, the persons who came did so because attracted by a scientific feast, instead of by banquets, concerts, illustrated lectures, parties, and free excursions; and a glance over the daily programmes proved that the discussions took a wide range, though the communications were hardly up to the standard of former years, while some of them were of exceptional excellence.

As usual, a "general session" was held at 10 A. M., which lasted but a few minutes, and then gave way for the sectional meetings in the various halls of the university. Each of the nine sections had its own vice-president. C. L. Doolittle, of Philadelphia, was chairman of the section of Mathematics and Astronomy; Ernest Merritt, of Cornell University, presided over the section of Physics; James Lewis Howe, of Washington and Lee University, Lexington, Va., was in the chair in the section of Chemistry; the vice-president of Mechanical Science and Engineering was John A. Brasher, of the Western University of Pennsylvania; James F. Kemp, of Columbia University, occupied the chair in the section of Geology; C. B. Davenport, of Harvard University, in that of Zoology; the chairman in the section of Botany was William Trelease, of the Shaw Botanic Garden, in St. Louis; the section of Anthropology was presided over by Amos W. Butler, of the Indiana Board of Charities; and Marcus B. Benjamin, of Washington, kept order in the section of Social and Economic Science. Mingled with the sectional meetings were those of the several affiliated societies.

The expression, "kept order," refers to the fact that when men of science get to handling politico-economic questions, they are apt to act like their non-scientific fellow citizens. A rather amusing episode proved this in connection with two very able papers read by the well-known statistician, Edward Atkinson, of Boston. One of these was on the "Distribution of Taxes," the conclusion being as follows:

"Slowly, but surely, the masses of the people find out that wherever the tax may be put, its burden ultimately falls on those least able to bear it. In a country which is under a government of the people, by the people and for the people, the military caste will ultimately be suppressed, and the burden of taxation for any purpose but peace, order, industry and self-defense will surely be removed."

His second paper was on "The Dominion of Iron and Steel. What It Stands For." In this he remarked as follows:

"The principal manufacturing States and countries, except the United States, are dependent countries, to whose people the export of manufactures is necessary to the supply of the means of living. The foundation of all manufacturing and mechanical arts rests upon coal and iron. As yet, no substitute for coal or coke has been found for the smelting of iron and steel, natural gas having served only as a small and temporary substitute. Without iron and steel and coal, Great Britain could never have established her sea power, to which so much importance is given by the advocates of militarism. Commerce is now the dominating power, and war is becoming as absurd and out of date as it is brutal and demoralizing."

These remarks were really mild compared with some of the utterances from the same source. But the breeze arose from Mr. Atkinson's incidentally affirming that "the United States government is spending annually $150,000,000 for the killing off of the Filipinos." This observation struck several members as out of place, and their sentiments were voiced by William H. Hale, of Brooklyn, who never lets his patriotism be hidden under a bushel. He stigmatized the utterance as seditious, and protested against its being printed among the proceedings of the American Association for the Advancement of Science. Mr. Atkinson retorted that he hoped it might be barred out, and reminded his critic that when that experiment had been tried by the government concerning one of his former publications it had ended by 100,000 copies being sent abroad instead of 2,000 copies. He also insisted that, rightly interpreted, his words were not seditious. It is queer that, thirteen years ago, another speaker before the A. A. A. S. was publicly rebuked by this same champion of loyalty who in this instance bearded the Boston anti-imperialist.

Repeated references were made by different speakers to the loss the association had sustained in the death of the genial, wise, and beloved Prof. Orton, of Columbus, O., who presided at the meeting last year. It was decided to hold the next annual meeting at Denver, Col., beginning August 24, 1901. Charles Sedgwick Minot, of Harvard Medical College, was elected president. The general secretary is William Hallock, Columbia University. The permanent secretary is Prof. L. O. Howard, of the Department of Agriculture.

PARIS EXPOSITION NOTES.

The official catalogues of the Paris Exposition are appearing slowly. The only section of the catalogue which was available on May 19 was that relating to the fine arts.

The United States has erected a pavilion in the Champ de Mars, near the Seine, in which are shown a number of exhibits relating to the postal service and the Weather Bureau. Among the exhibits of interest is a model of a 60-foot post office car, as used on the Chicago and Rock Island route; it is constructed on a scale one-sixth, and shows fine workmanship. A striking historical exhibit is the Rocky Mountain mail coach, built in 1868. It was the first to carry the mail in Montana, from Helena to Bozeman, making the trip once a week; it was captured by the Indians in 1877, but recaptured by Gen. Howard, after a hot pursuit. Among the distinguished persons who have traveled in it are Gen. Garfield, before he became President, and Gen. Sherman on his tour of inspection in 1877. Near it is a wax figure of a United States mail boy on a bicycle, carrying the mail bags. Hanging to a column is a mail bag which has a tragic history; it was carried by F. M. Peterson when making the trip to Lochiel, Ariz. He was captured by the Indians and killed; the bag shows the place where it was cut open by the Indians. A fine model of the United States mail steamer "City of Paris" is shown. In a case are assembled a number of historic objects, including a mail bag 240 years old, and said to be the first used in the United States. The first pneumatic carrier sent over the Philadelphia system is shown, and also the first carrier sent in New York over the Tubular Dispatch Company's system by Mr. Chauncey Depew. Another historic exhibit is that of a stuffed horse carrying a wax figure of a mail rider in cowboy costume; the horse was employed in the mail service in Colorado twenty-five years ago, and was killed by being obliged to cover 320 miles in one trip, owing to the absence of a relay. Next to this is a dog-sleigh, carrying two mail bags with three stuffed dogs, and the figure of an Indian mail carrier with leather costume and snowshoes. A number of frames contain different series of periodical stamps, and on the wall above is a representation of a train of cars on the Chicago and Rock Island route, composed of inlaid mother-of-pearl. On the other side of the building are a number of exhibits of the Weather Bureau, showing the different registering machines and the appliances for printing the weather maps. On the roof are installed a number of instruments to represent the working of the system; this part of the exhibit is now being completed under the direction of Prof. Marion.