whereby the route from Lake Huron to Lake Superior will be considerably shortened and generally improved.

A project is now being agitated, contemplating a direct connection between Lake Superior and Lake Michigan across the narrow portion of the peninsula between Marquette and Escanaba, whereby the passage through the Sault Ste. Marie would be entirely avoided, and much distance saved for the traffic between Lakes Superior and Michigan.

In the extension of the river-walls in New York harbor, under the Department of Docks, large concrete blocks are being used, weighing from 60 to 75 tons, and requiring hoisting-machinery of extraordinary size and power to place them in position. Similar blocks are being placed in the walls along the lake-front in Chicago, where they have been found to resist effectually the action of the waves in places where all former methods of protection have failed.

Railroads. — Sixty years ago railroads were unknown in this country. At that time the population of the United States consisted of 12,000,000 people. To-day we operate 160,000 miles of railroad, and our population has increased to 60,000,000 people. In 1830 the aggregate wealth of the United States was less than $1,000,000,000: at present it is estimated at $56,000,000,000. Just how much of this phenomenal prosperity may be due to the railroads, it is, of course, impossible to conjecture; but it may be safely assumed that they have very largely contributed to the result. While the population has increased during the last fifty years about 350 per cent, the ratio of increase of the railroad mileage for the same period has been nearly four times that of the population, which would seem to indicate that they have not only supplied a want of the past, but have kept well up with the contemporaneous growth of the country, if they have not, indeed, advanced beyond its actual necessities. The railroad mileage of the United States is now fully one-half that of the total railroad mileage upon this globe, while our population is only about one-twenty fourth part. and our area of territory only about one-twentieth part, of that of the inhabited world.

You have all heard the familiar illustration about girdling the equator a dozen times, more or less, with our railroad-tracks; but it will no doubt please you to know, that, since you heard the statement last, enough additional rail has been laid to give the equator another twist; and I might further supplement the illustration by the assurance that we have now a sufficient supply of materials in the tracks of this country to build a railroad to the moon. Over these 160,000 miles of railroad we carried last year 475,000,000 people, and transported 600,000,000 tons of freight. Upon these lines are engaged 1,000,000 employees. Their equipment consists of 30,000 locomotives, 21,000 passenger-cars, 7,000 baggage-cars, and 1,000,000 freight-cars. The capital invested in their construction and equipment amounts to $8,000,000,000, and the yearly disbursements for labor and supplies exceed $600,000,000.

The creation of these vast properties has been accomplished by aggregation rather than by preconcerted systematic development. The trunk lines of the present day are to a great extent composed of pieces of road originally built by local enterprises, and absorbed from time to time by lease or purchase, to constitute with other acquisitions, in connection with some specially constructed connecting links, the various systems under the management and control of the leading railroad companies of the country.

The recent revival of the temporarily abandoned Hudson River Tunnel project, and the proposed tunnel under the river at Detroit, are enterprises demanded by the necessity of continuous transportation lines for the through traffic of our railroads.

The numerous accidents which happen at points where public highways cross the railroads at grade, in spite of alarm-bells, watchmen, and safety-gates, have led to the enactment of laws in some of the Eastern States looking towards a gradual abandonment of existing crossings and the absolute prohibition of new ones in the future. During the years 1887 and 1888 there were abolished in Connecticut 93 grade-crossings, at a cost of $625,000. In Massachusetts a special committee of the Legislature has recently reported upon this subject, recommending that all dividend-paying roads eliminate annually 5 per cent, and all non-dividend-paying roads 2½ per cent, of their grade-crossings at the joint expense of the railroads and communities, and that in future no grade-crossings shall be permitted. It is to be hoped that the beneficial results of these wise measures will induce other States to take this subject under serious consideration.

The most noteworthy engineering feature in connection with the general progress of railroad construction in this country is the building of bridge structures upon a constantly increasing scale. In 1862 I triangulated the positions and laid the foundations for the piers of the channel span of the Ohio River bridge at Steubenville. This was the first iron railroad-bridge over any of the navigable tributaries of the Mississippi River. The length of its channel span was 320 feet, and it was the longest iron truss ever attempted up to that time. It was designed by Mr. J. H. Linville, still a member of this society; and it has carried in safety, and without accident, the traffic of one of the principal Western connecting lines of the Pennsylvania Railroad for twenty-five years, and is now being replaced by Mr. Henry G. Morse, also a member of this society, giving way to a double-track structure. To-day twelve railroad-bridges span the Ohio River between Pittsburgh and Cairo, and two more are in progress of construction. There are fourteen railroad-bridges over the Mississippi, and fifteen over the Missouri. Many of these structures have spans of 500 feet, and one of the projected bridges over the lower Mississippi was designed with a span of 730 feet; but this plan, I understand, has been abandoned, and a cantilever structure adopted in its place.

The erection of these large bridges has become a special business in this country, and the leading contractors engaged in that pursuit have acquired wonderful skill in the performance of this dangerous and difficult work. Few people appreciate the risks and hardships encountered, and the courage and judgment required, in dismantling an old railroad-bridge and erecting a new one in its place, with a deep and rapid river running underneath, a strong wind blowing, and a hundred trains passing daily over the frail, temporary supports, which must carry the traffic during the replacement. The mere erection of entirely new structures, free from the encumbrance of moving traffic, is considered an easy job.

In October last, the contractors engaged in the erection of the bridge at Cairo swung free and clear a 520-foot span in six days, and in November last the same parties erected the trusses of another span of 520 feet length in 44 hours, and more recently they erected a 400-foot span in 31 hours, the wind blowing a gale nearly all the time.

The successful completion during the past year of the Hudson River cantilever bridge at Poughkeepsie reflects great credit upon the builders and engineers in charge; and the equally successful completion and skilfully conducted erection of the Hawkesbury Bridge in New South Wales adds new fame to the same firm of contractors, whose leading partners are all prominent members of this society.

Whether the limit of possibilities in bridge construction will be reached in the execution of Mr. Gustav Lindenthal's design of a railroad suspension-bridge over the Hudson River, with a span of 2,800 feet, resting upon towers 500 feet high, and carrying, in addition to wagon-ways and foot-walks, six railroad-tracks, at a height of 150 feet above water; or whether the projected crossing of the British Channel will require still larger dimensions, — are problems which may perhaps interest at some future day the younger members of this society.

NOTES AND NEWS.

ACCORDING to an ancient superstition, says *Garden and Forest*, the beech is never struck by lightning; and so general has been this belief, that a gentleman recently thought it worth while to write to an English journal that he had been told of a lightning-shattered beech in Ireland. Beliefs of this sort are rarely without some degree of justification in fact, and it would be interesting to know whether in this country the beech has been observed to possess any greater immunity from electrical dangers than trees of other sorts.

— The *Gardeners' Chronicle* says that the gingko is proving itself one of the best trees for street-planting in smoky cities, thriving in the most impure atmospheres, and having as yet been attacked

by no insect or fungus disease. In this country, according to *Garden and Forest*, no extensive use has been made of the gingko as a street tree except in Washington, where of course it is not subjected to the test of an atmosphere impregnated with smoke. If it is, indeed, able to withstand the most unfavorable conditions, it might be more generally adopted; for it grows rapidly, its shape well adapts it for association with architectural forms, and the peculiar character of its foliage always makes it interesting to the popular eye.

— The true eating banana, or "madura," is said to be unknown in northern countries, the varieties we import being simply those which are used in the land of their growth for cooking-purposes. *Garden and Forest* states that many varieties of the madura are recognized, each of which is distinct in flavor. The smaller are the more delicious; and the smallest of all, the so-called "lady-finger banana," with a skin hardly thicker than paper, is the most highly prized. Green cooking-bananas are peeled, and roasted in the ashes, and eaten with butter; partially ripe ones are boiled for a few minutes with the skin on, and eaten with sirup or honey; and ripe ones are sliced lengthwise, and fried in olive-oil or butter.

— It will be new to some Americans, even though they know that peaches are commonly cultivated under glass in England, to be told that cherries are also grown in this manner. A correspondent of the *Gardeners' Chronicle* recently described the cherry-house at Gunnersbury Park, where many different varieties afford fruit at different times during the season. "When the trees are started into growth," he says, "a temperature of 45° by day, and 40° by night, is maintained. When they are in flower, plenty of air is given, and the bees are encouraged to work among the blossoms as much as possible. Scarcely any fire-heat is employed: indeed, it had been employed only once or twice in order to keep out frost. At the time of flowering, plenty of ventilation is given, top and bottom. As soon as the fruit has set, the house is closed up somewhat, and the temperature kept quite cool until the stoning process is over; then it is kept a little closer, as when the fruit has stoned it ripens quickly. It is a little difficult to thin out the fruit previous to the stoning stage, as it is uncertain which fruit will mature, and which fail. A good watering is given to the trees before they get into flower, and then water is applied with moderation until the fruit has set. Cherries appear to do best, and set their fruit more freely, when somewhat dry at the roots, whether the trees are planted out or in pots, and it appears to be quite certain that all flower more freely when worked on the mahaleb than when on the cherry stock."

— The following interesting report to the United States Hydrographic Office from the American steamer "Indiana," Capt. W. I. Boggs, seems to indicate a normal condition of the Gulf Stream in the regions and during the times stated: "From noon of May 22 (latitude 40° 20′ north, longitude 60° 8′ west) to noon, May 23 (latitude 40° 46′ north, longitude 54° 29′ west), experienced a current setting N. 68° E., drift 16.4 knots. The temperature of sea was noted every two hours: maximum temperature, 72°; minimum temperature, 60°; mean temperature, 66°. From noon of May 24 (latitude 41° 15′ north, longitude 49° 3′ west) to noon, May 25 (latitude 43° 49′ north, longitude 43° 47 west), current set N. 51° E., drift 23 knots. The temperature of sea was noted every two hours (and during hours of darkness every half-hour): maximum, 64°; minimum, 54°; mean, 62°; twenty-four observations being taken." It is interesting to note, in this connection, that during the above period, and for fully a week previous, no general storms occurred in the regions referred to. On the contrary, the winds were variable in force and direction, seldom reaching a force of 6 (Beaufort's scale).

— Attention is called to certain changes that have been adopted on the "Atlantic Pilot Chart" for July, which, it is thought, will commend themselves to all who have occasion to use it. The most important of these is the enlargement of the area represented, the eastern limit being now 10° east longitude (instead of 4°, as heretofore). This allows the whole of the North Sea to be shown, more of the Mediterranean than before, and the entire Gulf of Guinea. The system by means of which the prevailing winds are indicated in each ocean square has also been changed slightly. Instead of representing a north-east wind, for instance, by an arrow pointing *away* from the centre of the square at the *south-west* point of the compass, it is now represented by an arrow pointing *toward* the centre at the *north-east* point of the compass. This is regarded as more graphic than the old method, the point of each arrow giving, at a glance, the true direction of the wind (the point from which it blows).

— The Brooklyn Academy of Science, a society incorporated Aug. 22, 1888, has opened a free reading-room in their rooms in Warner Institute, Willoughby Avenue and Broadway, in that city. The various scientific journals will be upon the tables, and there is no charge to the public. Donations of papers will be greatly appreciated.

— A boiler may be inspected to-day and found to be safe under a working pressure of one hundred, and be weakened to-night by low water so as to be dangerous to-morrow with fifty pounds pressure. Yet, as the *Age of Steel* says, it may explode a month hence with sixty pounds pressure and plenty of water, but the cause is as certainly low water as if it had exploded when the water was low. There is but one sure remedy, and it is a simple one. Put on a real safeguard, something simple, which has been tried, and proven to be trustworthy.

— According to the *British Medical Journal*, the programme of the Leeds meeting of the British Medical Association in August next "is developing in such manner as to afford the ample promise of a meeting of great scientific as well as social interest, and one which will be worthy of the traditions of this great medical centre."

— The sacred lotus (*Nelumbium speciosum*) has become established in a pond in New Jersey, and proves hardy, although the surface of the water is frozen over during the winter. The history of its planting, by E. D. Sturtevant, is given in *Garden and Forest* for April 10, with a fine photo-engraving of the spot, showing hundreds of open flowers.

— There seems to be every prospect, according to *Engineering*, that the efforts made by the French engineers to entertain the American party of engineers will be very successful. It is intended that an hour and a half or two hours should be spent in Calais to examine the new harbor-works there; and the special train which the Northern Railway of France has so liberally placed at their disposal will make a détour and stop near St. Omer, to give the engineers an opportunity of inspecting the great hydraulic canal-lifts. On the day after their arrival in Paris nothing official will be done, but on the following morning a formal reception will be held at the offices of the French Society of Civil Engineers. The party will then breakfast with M. Eiffel on the first story of the tower, and will afterwards ascend to the top in detachments. A part of this day will also be spent in an organized visit to the exhibition. The Ville de Paris has made arrangements for an excursion through the Paris sewers, and further visits to the exhibition and elsewhere will be paid. One of the most interesting of the latter will be the compressed-air installations of the Popp Company. Altogether, though the Paris programme is not yet complete, it is certain to be a very full, hospitable, and attractive one.

— *The Engineering and Mining Journal* says, "It will be remembered that some enterprising associated press agent startled the country a few weeks ago by announcing that the Standard Oil Company had wired from the Media works to Philadelphia for two hundred bull-dogs, which news item the telegraph editors and 'home correspondents' of some of the metropolitan dailies ingeniously enlarged into a small-sized sensation, lasting a day or two, until it was discovered that the 'bull-dogs' wanted were merely harmless lifting-jacks of a particular style. As an example of how so much remarkable literature is floated, observe the following judicial and editorial comment of one of our technical exchanges in its issue of June 22, at which late date it does not seem to have yet 'caught on:' 'The Standard Oil Company has, however, introduced a new style of watchman, which we think will be efficient. The company has suffered a good deal by tramps and loafers getting too near its tanks and smoking, and thus setting fire to the gas

generated by the oil, which ignites easily; and it has now given an order to a dog-fancier's association for two hundred bull-dogs, to range in age from six months to a year, the price to be fifteen dollars each. The dogs are to be placed where the company has distributing-stations, and used in the field to guard the large iron tanks that are full of oil. The bull-dog watchman certainly has this merit over the average biped private watchman, that he neither smokes, drinks, nor goes to sleep on watch.' "

— We learn from *Nature* that the Russian Academy of Sciences offers a prize of $2,500 for the best inquiry into the nature and effects of the poison which develops in cured fish. The objects of competitors must be: "(1) To determine, by means of exact experiments, the physical and chemical nature of the poison which develops in fish; (2) to study, by experiments on animals, its action upon the heart, the circulation of the blood, the organs of digestion, and the nervous system; (3) to determine the rapidity of its absorption by the digestive organs; and (4) to study and describe the characteristics which may serve to distinguish contaminated fish from such as are not contaminated." The fifth and sixth questions, with which it may be impossible for any one to deal satisfactorily, relate to the means of preserving fish from the development of the poison, and to the question of counter-poisons and the medical treatment of poisoned persons. The competition is open to all. The memoirs must be sent in, either in manuscript or printed, before Jan. 1, 1893, and may be written in any one of the following languages: Russian, Latin, French, English, German. If none of the papers is deemed worthy of the full prize, the accumulated interest upon the above-named sum may be handed over to the author who presents the best solution of some part of the problem.

— Arrangements have been made for a daily exchange of telegraphic weather reports between Washington and Havana during the present hurricane season. Early and reliable information can be obtained at any branch hydrographic office.

— The forecast of weather on the Atlantic for July by the United States Hydrographic Office is that generally fair weather will prevail. Occasional moderate gales, frequently accompanied by electric phenomena, will be felt north of the 40th parallel; and West Indian hurricanes are apt to occur, especially during the latter part of the month. Frequent fogs may be expected over the Grand Banks, along the northern coast of the United States, and in the neighborhood of the British Isles. Icebergs are liable to be encountered in the vicinity of the Grand Banks, between the 46th and 53d meridians, as far south as latitude 42° 30′ north. Field-ice should be looked out for to the eastward and southward of Newfoundland and off the coast of Cape Breton Island.

— On July 22 an electric exhibition will open at St. John, N.B., to last ten days. This is in honor of the opening of the Canadian Pacific Railway to St. John.

— The Canadian Pacific Railway, in spite of its northerly latitude, seems to have overcome the snow difficulty. The total detentions during the past winter from this cause were only seven hours, the snowsheds and split and glance fences protecting the line in a very perfect manner, though some very heavy avalanches fell in the Selkirks.

— People may walk until they are fatigued through the almost endless buildings on the Champ de Mars, and yet fail to find any great and striking object by which they would especially remember the exhibition of 1889. The place is filled with evidences of untiring industry and skill on every side, but there is a strange absence of great novelties. We believe, however, that the exhibition will be famous for four distinctive features, — in the first place, for its buildings, especially the Eiffel Tower and the Machinery Hall; in the second place, for its Colonial Exhibition, which for the first time brings vividly to the appreciation of Frenchmen that they are masters of lands beyond the sea; third, it will be remembered for its great collection of war material, the most absorbing subject nowadays, unfortunately, to governments, if not to individuals; and, fourth, it will be remembered, and with good cause by many, for the extraordinary manner in which South American countries are represented. Several of those nationalities are beginning to put themselves forward as appreciable factors in the politics of the world, and, what is of more interest to the manufacturer, they constitute the richest and largest customers in European and North American markets. Especially this is the case with regard to agricultural machinery of all kinds, and those exhibiters are fortunate who are well represented in this respect.

— Mr. Henry William Bristow, F.R.S., died on Friday, June 14, at the age of seventy-two. In 1842, according to *Nature*, he was appointed a member of the staff of the Geological Survey of the United Kingdom. Mr. Bristow published various works on mineralogy and geology, and was the author of the mineralogical articles in Brande's "Dictionary of Science, Literature, and Art," and of articles on minerals and rocks in Ure's "Dictionary of Arts, Manufactures, and Mines." He became a fellow of the Geological Society in 1843, and of the Royal Society in 1862, and an honorary fellow of King's College, London, in 1863. He received the diploma of the Imperial Geological Institute of Vienna, and from the King of Italy the diploma and insignia of an officer of the Order of SS. Maurice and Lazarus.

— In reference to the destructive volcanic eruption on the Island of Oshima (better known to the Western world as Vries Island), it seems that the first news of it was brought to Yokohama by the master of a passing steamer, who described the mountain Miharaizan as being in fiercely active eruption on the morning of April 13. The eruption was of such a nature that it attracted attention on board the steamer at a great distance. Afterwards it was ascertained that the outbreak was at the western base of the mountain. From this it would appear that a new crater has been formed, as the old crater is at the top of the mountain, though there is a place to the south-west whence smoke is always issuing from the sands. The *Japan Weekly Mail*, from which this information is taken, gives the following historical account of this remarkable volcanic island. Miharaizan, according to the oldest Japanese historical records, was an active volcano so far back as 684 A.D., but the earliest authentic notice of its activity appears to have been taken in 1421, when the sea boiled, and the fish died in shoals. In 1684 an eruption commenced which lasted seven years; and in 1703 there was a great earthquake and tidal wave, and part of the island broke down, and formed the present harbor. In 1777 the mountain was in active eruption, and the island was covered several inches deep with ashes, such phenomena being almost constantly repeated from that date till 1792. It was then quiet till 1837, and more or less in action for the following twenty years. Another lull then took place, when, in 1868, it again broke out, and continued in action four days. The next eruption occurred in 1876, and lasted nearly two months. The most destructive eruptions of Miharaizan were probably those of 1781 and 1789, as during the latter the village of Shimotaka was entirely destroyed, and the people and their houses were completely buried in ashes. There are at present six villages on the island, containing a population of five thousand persons, mostly fishermen.

— Maria Mitchell, the well-known astronomer, until recently professor of astronomy at Vassar, died June 28 at Lynn, Mass. Miss Mitchell was born in Nantucket in 1818, and inherited her love of astronomy from her father, a bank cashier who made a hobby of astronomical investigations. It was one of Miss Mitchell's ambitions to discover a telescopic comet, — an ambition that was satisfied in 1847. For this discovery a medal was presented to her by the King of Denmark, although, doubting the reality of her discovery for a time, Miss Mitchell had delayed publishing it, — a delay which came near losing her the honor, as European astronomers had found the same comet, and made earlier publication. It was through the earnest presentation of her case by Edward Everett that the medal reached this famous woman astronomer.

— Theodore Dwight Woolsey, president of Yale College from 1846 to 1871, died July 1. He was born in New York, Oct. 31, 1801. Besides his Greek text-books, published early in his career, his sermons and essays, President Woolsey wrote the well-known "Treatise on International Law."