served in the British Museum, and the other a part of a palace. It was not possible to secure an authentic representation of a Phœnician house, although the suggestions and opinions of the most competent critics have been followed. The result is therefore not much more than a high probability, but as such it possesses great interest. The dwelling has a stone base, with the upper part of wood, ornamented with long slender columns, and with a balcony above.

Like the Assyrians, the Hebrews have two kinds of dwellings, — one a tent, modelled after a carving in an Egyptian tomb dating from before the time of Moses; and the other a stone house, with a flat terraced roof. Here, also, there is want of authentic material, and the result cannot be regarded as more than approximate. The Pelagic hut is a simple one of large stones, while the Etruscan residence consists of a stone basement taken from an ancient terra-cotta model, and an upper portion of wood, with an open-roofed balcony, which is confessedly the personal fancy of the architect. The result, however, may be regarded as near the actual truth as our present knowledge permits.

This completes the first series, and we come to those peoples whose civilization has been affected by the Aryan invasions. First is the Hindoo house, — a tall, narrow affair, built after a bas-relief from the top of Sanchi, though the architect has availed himself of the criticisms of Mr. Fergusson. The Persian house comes next. It is in two parts, — one closed, intended for the women; the other, with a dome of enamelled brick, is the public part, and intended for the master himself and his friends. It is designed after information furnished by M. Dieulafoy. Then comes a German village, — rude wooden cabins, with an elevated structure on poles, which serves as a sort of observatory. Close to this is the Gaul house, — a circular hut of wood, stone, and beaten earth. The former is taken from the bas-reliefs of the column of Trajan, while the latter is taken from a host of authorities that render it probably exact. A Greek house of simple construction comes next. A projection at one side serves to accommodate strangers. The walls have, among other inscriptions, the name of the proprietor, "*Heracles habite ici; que rien de mauvais n'y entre.*" The Roman house, which comes next, is an exact reproduction of a Pompeiian villa. The plan and details of this edifice have been prepared with the greatest care.

A new element in civilization is now introduced by the invasions of the barbarians. The first represented are the Huns, who lived in a wagon, and had no regular dwelling. A Gallic-Roman house of the fifth century follows, and is built of fragments of other buildings, which gives it a very peculiar appearance. The Scandinavian house dates from the fourteenth century, and is of wood, with a granite foundation. It has been designed after the suggestions of the Swedish architect Boberg, who has made a special study of early Scandinavian dwellings. Three other buildings bring us almost to our own times. These are, first, a Romanesque house of the time of the successors of Charlemagne (tenth century); second, one of the middle ages (twelfth century), and contemporary with St. Louis; and the third, a specimen of the civil architecture of the Renaissance, a reproduction of a sixteenth-century house at Orleans.

Four other examples complete the list of the civilizations contributing to the general culture of humanity. These are a Syrian (Byzantine) house of the time of Justinian (sixth century), which is an exact copy of one restored and drawn by the Marquis de Vogüé. It is of stone, as wood was scarce in that part of Syria. A Slavic house, almost a primitive affair, comes next, and is close to the Russian house of the fifteenth century. This latter is in two parts, — one for men, and one for women, — with an external staircase. No material for an authentic dwelling of this period was to be had, but the edifice possesses characteristic features. An Arab house of the eleventh century carries us into an entirely different civilization. The building is not a representation of any standing edifice, but is a combination of authentic elements. Lastly comes a Soudanese dwelling, which, though comparatively modern, is, by reason of its very strangeness, one of the most interesting of the entire collection. This brings us to the third section of the series, those illustrating isolated civilizations. There are houses of China and Japan, huts of the Eskimo and Laplanders, a negro village from Africa, and an Indian hut from North America. The collection is closed by houses from ancient Mexico and Peru.

Barr Ferree.

NOTABLE DERELICTS IN THE NORTH ATLANTIC.

Of the many wrecks afloat in the North Atlantic Ocean, none has as interesting a history as the Italian bark "Vincenzo Perrotta." Abandoned Sept. 18, 1887, this vessel has been represented graphically on every edition of the "Atlantic Pilot Chart" published since that time. Her wonderful drift began in about latitude 36° north, longitude 54° west; and on April 4, 1889, when last reported, she was about 60 miles north of Watling's Island, in the Bahamas. She had thus made good a distance of about 1,400 miles in a general south-west by west direction in one year six months and sixteen days. She has been reported twenty-seven times in all, and when last seen had mizzenmast and about ten feet of mainmast standing, foremast gone, end of jibboom broken off, and port anchor on bow.

On Nov. 26, 1888, the schooner "Ethel M. Davis" was capsized in a hurricane, in latitude 35° 4′ north, longitude 70° 52′ west. Her crew was rescued after having been adrift four days. The schooner eventually righted, and began a long voyage, unguided, in the general direction of the Gulf Stream. She was last seen June 8, 1889, in latitude 42° 36′ north, longitude 57° 38′ west, and at that time had about three feet freeboard in waist, forecastle and poop well above water. Her poop-house is painted white, and shows out well; mainmast gone, bowsprit and ten feet of foremast standing; general drift, about 900 miles north-east by east; time, six months eighteen days; number of times reported, fifteen.

The same hurricane that wrecked the "Ethel M. Davis" also brought disaster to the schooner "David W. Hunt." This vessel was abandoned Nov. 25, 1888, in latitude 34° 30′ north, longitude 72° 30′ west. She was last reported May 26, 1889, in latitude 45° 30′ north, longitude 41° 30′ west, at which time she had her bowsprit and jibboom complete, stumps of two masts broken off about fifteen feet from deck; general drift, east-north-east about 2,000 miles; time, six months; number of times reported, twenty-two.

The schooner "Palatka" bids fair to rival the above vessels in point of interest. She was abandoned April 10, 1889, off Hatteras, and was last reported June 4, 1889, in latitude 43° 20′ north, longitude 56° 34′ west. She was then water-logged and on fire, stern high out of water, no masts standing. Like the "Ethel M. Davis" and "David W. Hunt," she, is right in the highway of the great bulk of transatlantic commerce, and a serious menace to navigation. In one month and twenty-five days she has made good a distance of about 1,200 miles, on a general north-east by east course; number of times reported, twenty-one.

The above four derelicts were all timber-laden, and this accounts largely for their great tenacity and buoyancy, at the same time rendering their destruction no easy matter. Commander C. H. Rockwell, U.S.N., of the United States steamship "Yantic," recently engaged in blowing up wrecks, says, "From the experience thus far gained in the work, I am convinced that lumber-laden derelicts are very tenacious, and can only be overcome by repeated blows from explosives of great power. These continued will undoubtedly do the work."

PROGRESS OF ENGINEERING.[1]

The provision of the By-Laws of this society which requires that its president shall deliver, at the annual convention, an address upon the progress of engineering during the preceding year, has been observed by my predecessors in various ways. While some of the former presidents have confined themselves strictly to the constitutional provision, by general reviews of the professional progress and scientific advancement of the period, others have dwelt more in detail upon some specific subjects of particular interest at the time. I trust I may be permitted, in this instance, to give you first a cursory glance of the field at large, and then confine myself more particularly to a review of the progress in that

[1] Address of Max J. Becker, president of the American Society of Civil Engineers, delivered at the annual convention of the society at Seabright, N.J., June 20.

special part of the profession with which the long-continued performance of my official duties has afforded me opportunities to become more familiar.

Electrical Engineering. — Of all the forces of nature, the one which has remained a hidden mystery longer than all the rest, but which of late has distanced all in the rapidity of its development, and which is certainly destined to excel them all in the extended range of its useful application, — electricity, — stands pre-eminent.

In the prosecution of subterranean or subaqueous operations, such as tunnelling, mining, sinking of caissons, the use of electric light is found to be of special benefit. In its incandescent form it is absolutely safe against the dangers from explosive gases, and in caisson work it removes the risks and inconveniences incident to the ready and rapid combustion of inflammable substances under the influence of high atmospheric pressure.

Street-Railways and Rapid Transit. — The rapid growth of our cities gradually forces the inhabitants to seek their homes in the suburbs and surrounding country, more or less distant from the business and manufacturing centres where their employment lies. The desire for economy of time, and the necessity for punctuality and prompt attendance, have led to the introduction of various modes of conveyance, beginning with the street-car tramways propelled by horses, followed more recently by elevated railroads and cable-car lines, and still more lately by the electric railroad; which latter system has, within a few years, developed much more rapidly than any of the preceding methods.

At the close of the past year there were completed and in course of construction, in this country, eighty-five electric railways, comprising about 450 miles of track, and the reports show that during the last year over eighteen millions of passengers have been carried over these lines.

The cheapness of original construction and subsequent maintenance and operation commends their adoption in smaller cities, where the older systems would be out of the question; and the practicability of their application in situations which would exclude cable-lines and horse-traction has led to their introduction in places like my own home, Allegheny City, where an electric railway is now in successful operation, which, in a distance of one mile out of a total length of four miles, ascends, with a speed of fully four miles per hour, a hill over 400 feet high, upon gradients of 12½ per cent, with numerous curves of 40 feet radius, the cars being often loaded with 75 people. Upon the lower portion of this line the electric current is supplied by means of an underground current, and on the upper portion of the line by the ordinary overhead conductors.

But while undoubtedly the electric railway will be generally preferred in the immediate future, it is by no means to be inferred that the cable-lines are to be considered as the motors of the past. On the contrary, their use will not only be continued, but greatly extended, wherever the conditions and circumstances favor their adoption. Among the advantages which they possess, are uniformity of motion, generally satisfactory speed, and the ease with which, in times of heavy travel, the vehicles can be multiplied and combined into convoys; and the facilities which they afford to converging horse-car lines, whose carriages they can attach to their own at the points of junction, saving thereby transfer of the passengers. The machinery used at the power-houses of some of the principal cable-lines is of very superior character, and some of the details employed are models of skill and ingenuity. Noteworthy among these are the engines of the Brooklyn Bridge cable-line, which many of us admired during the excursion at the time of the last annual meeting, and which are very interestingly described n a recent contribution to our "Transactions" by Mr. Gabriel Leverich, one of our members, and at one time secretary of this society.

Elevated railways propelled by steam must necessarily remain confined to larger cities, where the volume of traffic promises a return for the capital invested in their expensive construction, and where the distances to be reached are sufficiently great to make the saving of time, by means of their superior speed, an inducement for patronage.

Water-Works. — The introduction of water-works is now so extensive in this country that there are but very few cities or towns of more than five thousand inhabitants which are not supplied with one system or another. The beneficial results upon the health of the populations are universally recognized, and the sanitary blessings and the advantages in point of comfort are beyond all calculation. Wherever additions and changes become necessary in the older cities, wise precautions are generally taken, under the advice and direction of professionally skilled experts, to profit by former lessons, and to avoid the errors of the past.

The most extensive enterprises now in progress in connection with water-works extensions are the improvements embracing the new lake tunnels at Chicago and Cleveland, the new Croton Aqueduct in the city of New York, and the aqueduct extension in Washington, D.C. In all these cases the question of greater purity has been carefully considered in connection with the increased supply.

The collection and storing of water-supplies for large cities and manufacturing purposes require, in many cases, the construction of extensive reservoirs, with massive dams for the retaining of the reserve supply. The importance of constructing these dams of proper shape and size, and of suitable material and good workmanship, so as to insure their absolute strength, and give them sufficient resisting capacity against every possible contingency, has been taught by a recent lesson of frightful experience; and while the responsibility for this calamity may not be placed upon the shoulders of the profession, yet it will be well for its members to look upon it and remember it as a warning and an example.

An investigation of the cause of the failure of the South Fork dam is now being made by a committee appointed under a recent resolution of this society, who have just returned from a visit to the scene of the disaster.

Examinations and measurements of the structure and its surroundings, and extensive information obtained from various sources, will enable the committee to submit to the society in due time a comprehensive statement of the conditions and circumstances which have induced and contributed to this most disastrous failure.

Sanitary Engineering. — The extensions and improvements of the water-supplies of our cities naturally lead to the adoption of measures for the disposal of sewage. The respective merits of the different methods employed for this purpose have been very ably presented to the profession from time to time, in occasional contributions to our "Transactions," by several members of this society, who stand pre-eminent in their special calling; so that all that would now seem necessary in an emergency is the exercise of sound and impartial judgment in the adoption of the proper method for each special case.

The system most generally used in this country now, and which will no doubt be preferred for a long time to come, is that of common water-carriage by means of the so-called "combined" plan of discharging all sewage and storm-water together through common outlets into adjacent rivers, lakes, or tidal waters. The objectionable features of this method consist in the pollution of the streams and lakes, from which, in turn, the water-supply may have to be drawn; and the injurious effects caused by the deposit and periodical exposure of offensive matter upon the shores of tidal waters.

In order to overcome, at least partially, these objectionable features, modifications of this method have been tried, consisting in a filtration and chemical purification of the sewage so as to reduce the offensive portions, and to render their final deposit into the streams of the district comparatively harmless. The methods employed for some time at Pullman, Ill., and more recently at Orange, N.J., are samples of this system.

Under the provisions of a law passed by the Legislature of Massachusetts in 1886, the State Board of Health is authorized to investigate, through a commission of experts, the effect of sewage discharge upon the streams and inland waters of the Commonwealth, and to recommend to the courts annually plans in remedy of existing evils. Acting upon the reports of this board, several cities are now making preparations for the disposal of their sewage by various methods of purification and dilution. In connection with some of these systems, the fluid portion of the sewage is utilized as a fertilizer of farm-land.

By the general introduction of natural gas as a domestic fuel in Pittsburgh and other Western cities, a large amount of kitchen-

garbage and house-sweepings, which heretofore were regularly burned with the solid fuel then in use, can no longer be disposed of in that way; and after various unsuccessful attempts to bury them, deposit them in the rivers, and burn them in open air, a number of specially designed furnaces were built for the destruction of these accumulations, to which are now added the offal from slaughter-houses, the leached-out bark from tanneries, and all garbage from the public markets. The heat created by the combustion of these waste substances is successfully utilized for generating steam in boilers attached to the furnaces, which, without the addition of any other fuel, except what is required for ignition, supply the motive power for operating the machinery in adjoining factories; so that these establishments not only improve the sanitary condition of the community by the prompt and radical destruction of vegetable and animal refuse, otherwise liable to decay on our hands, but also furnish a cheap fuel-supply for industrial purposes.

Streets and Highways. — Nearly all the larger cities of this country have now passed the experimental stages of their street-paving experiences, and have by this time entered upon a period of more permanent and substantial improvements in that department of municipal engineering. The days of wooden roadways, the Nicholson, the cedar, and locust blocks, will soon be remembered only as things of the past, like plank roads of earlier date. The various compounds with which, at one time or another, nearly all our city streets have been plastered over and poulticed, have cracked and split, shrunk, melted, and evaporated, and been carried off piecemeal, in course of time, by the persistent adhesion of their ill-flavored mixtures to the boot-heels of the weary pedestrians in hot weather. The abominable cobble-stones, which have jarred our nerves and dislocated our spinal columns in years gone by, are finally relegated to the by-streets and back alleys. Such makeshifts may answer the purpose for a while in new towns of rapid growth, where better materials are not readily attainable, and where first cost is a paramount consideration; but they should never be renewed to the extent that has been the case so often, in spite of the most convincing experience, and contrary to the best counsel of professional advisers. The sums of money wasted in repeating these mistakes would in many instances have gone far towards carrying out much more permanent and substantial improvements.

For streets in the vicinity of freight-stations, or of manufacturing establishments employing heavy teaming, and for streets with steep gradients, pavements should be made of stone blocks of basalt, trap-rock, granite, or hard limestone, laid upon a bed of broken stone ballast, topped off with sand or fine gravel, well rammed, and joints filled with cement grouting or coal-tar; for streets used by lighter traffic or carriages only, a well-laid pavement of pure asphalt upon a bed of stone ballast answers the purpose very well, if prompt attention is given to the maintenance and necessary repairs; for parks and suburban pleasure-drives, a good macadamized road, well drained, and constantly kept in condition, affords a very superior and comfortable highway.

Of late years, pavements of hard burnt fire-clay brick have been extensively laid in many cities and towns of the Middle States, where the supply of this material is very abundant and remarkably cheap. In some towns of West Virginia and eastern Ohio such pavements have been laid for less than a dollar per square yard. They make smooth roadways, are easily kept clean, and last very well under moderately heavy traffic. This pavement is especially well adapted for cities of medium size, which cannot well afford more expensive kinds, and yet require something more substantial and durable than either asphalt or macadam.

But if there is one thing which needs reformation more than any other, it is the condition of our common country roads. If it is true that the highways of a people are a measure of their civilization, then we cannot complain if we are classed as an inferior type of low barbarians. The good nature with which we submit to the imposition of the annual road-tax is only equalled by the sublime resignation with which we accept the result of the effort which swallowed up our money. Our Western members all know what is meant by "working the roads." It means to plough a furrow on each side, and scrape the mud into a ridge in the middle, simply to be washed down again into the ditches by the first shower of rain. And this performance is repeated year after year, under the provisions of our statutes, and by the consent of a law-abiding but much-suffering people. During the spring and fall, we struggle through the mud manfully as best we can; and when winter comes, and the bottom literally drops out of the roads, we quietly compose ourselves, and contentedly stay at home.

Some years ago, while out on an exploring expedition for a railroad in southern Ohio, I was compelled to hibernate, so to speak, with my entire party, for nearly a month, in a lonely village among the hills of Wills Creek in Noble County; and, when I made an effort to advise my employers of our situation, I was cheered by the comforting assurance of the postmaster that my letter would certainly go out just as soon as the roads dried up.

A faint ray of hope, however, is just beginning to dawn in some parts of the country, most conspicuously in Ohio, where, under the provisions of a recent law, a number of free turnpikes are being built, of quite a superior character, by special tax levied upon the adjacent property.

The beneficial results of this wise system of improvements are very great, and highly appreciated by the people, and it is sincerely to be hoped that other States will profit by the example.

Canals and Hydraulic Engineering. — The days of ordinary canal navigation in the interior parts of this country may well be considered as numbered with the past. With the exception of the Erie Canal, which still maintains to some extent its character as a waterway of commerce, and excepting some parts of the canals in eastern Pennsylvania, New Jersey, Maryland, Ohio, and Illinois, these primitive transportation lines have either been abandoned entirely, after outliving their short period of usefulness, or they are now merely utilized for carrying bulky products between local points, or for the supply of hydraulic power to manufacturing establishments.

Still more discouraging are the immediate prospects for the various maritime canal projects. The Panama Canal, upon which very large sums of money have been expended, has finally been abandoned, after many unsuccessful efforts of its projectors to raise the funds still required for its completion, and after, as a last resort, modifying the original plans of a sea-level canal to one with locks. But notwithstanding this momentary failure, I most sincerely hope — and I honestly believe — that it is yet reserved for American engineering skill and American enterprise to resurrect and successfully carry forward this great and important project to its ultimate completion.

The Tehuantepec Ship Railway, which, for the purpose on hand, may properly be classed with the maritime canals, has not met thus far with the encouragement which its importance and the unqualified indorsements of eminent professional talent would seem to justify. Probably the sad fate of its Panama rival, which places it for the present out of the range of active competition, may assist in reviving the ship-railway project to which our lamented fellow-member, the late Capt. Eads, devoted his energies during the last years of his useful life.

New interest is being manifested in the old ship-canal project across the Isthmus of Nicaragua, which, in the matter of demonstrable feasibility, undoubtedly has many points in its favor.

Among other ship-canal projects in active progress may be mentioned the Cape Cod Canal, which was commenced in 1880, and which will, when completed, connect the Bay of Cape Cod, by way of Herring River, with the head of Buzzard Bay in Massachusetts.

The magnificent success of the ship-canal at Sault Ste. Marie, not only as an engineering project but also as a commercial enterprise, has surpassed all expectations; and since its completion the traffic upon the northern lakes has been multiplied to such an extent that it has been found necessary to build an additional canal and a new lock of larger dimensions even than the one now in use. The direct impulse given by the completion of this canal to the lake navigation, and the indirect effect upon the general business of that region of country, have stimulated the work on the hydraulic canal at Sault Ste. Marie, from which great results are expected; and they have also hastened the operations in progress for deepening and widening the channels through the shallow parts of Hay Lake,

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