Correspondence.

The Recent Earthquake.

To the Editor of the Scientific American:

Since forwarding you my reply to P. M. F.'s criticism in your issue of Oct. 9 of my article relative to the earthquake, I have to supplement the same with the following clipping from the Washington *Star* of October 13:

"BENEFITED BY THE EARTHQUAKE.

"A strange result of the recent earthquake has been discovered by Prof. John Collett, the Indiana geologist, who states in an interview that a number of wells bored in Indiana and Ohio for gas or oil yielded nothing before the earthquake, but since that occurrence gas in good paying volume and oil in considerable quantity has come into many of them."

This seems to substantiate in a measure the theory originally advanced by me. My previous reply shows the insufficiency of P. M. F.'s reasoning, and the quoted article above proves that his averment as a fact that no such effect of the earthquake had been observed was premature. EDWARD W. BYRN.

Washington, D. C., Oct. 13, 1886.

Home-made Indian Clubs.

To the Editor of the Scientific American:

Possibly I can suggest a cheaper, more easily obtainable, and more durable home-made Indian club than your issue of August 14 presents.

Between twenty and twenty-five years ago, when the rage for Indian clubs was coming on, and when those who wanted them had to get them turned to order at an expense of a couple of dollars or more, and when my new domestic alliance absorbed such change to keep the pot boiling, I drew from our pile of fire wood, obtained from torn-down buildings, a couple of pieces of old three inch joist, and with hatchet and saw made a pair of clubs that I have used almost daily ever since, and although flattened (rather than entirely round), in order to secure sufficient weight, they fully "fill the bill." W. H. WETHERILL.

Philadelphia, October, 1886.

Great Rise of the Sea at Sabine Pass.

Sabine Pass is an inlet from the sea which forms the dividing line between the States of Texas and Louisiana. The town of Sabine Pass, near the sea coast, had 400 inhabitants. It is connected with the mainland by a railway. The adjoining town of Johnson's Bayou had a population of 1,200, Radford and other towns still more. The whole region for many miles in all directions is low ground. The settlements were mostly built on ridges, rising ten or twelve feet above sea level. On Tuesday, October 12, a great storm prevailed, during which the sea rose to an unprecedented height and swept everything away—human beings, dwellings, live stock, all were hurried to destruction.

A dispatch to the *Times-Democrat* says: "The village of Johnson's Bayou is a high ridge on the sea coast, and the bayou, from which it takes its name, runs through the inhabitable parts of that section of the settlement, in which is also situated the post office station known as Radford. They are in Cameron Parish, on the Louisiana shore, six miles east of Sabine Pass. The bayou is nineteen miles in length, and varies from one to four miles in width. Ridges face the Gulf 12 feet above the sea level, and in the rear is a dense and impenetrable marsh. The population on Monday, Oct. 13, numbered 1,200 souls; to-day 85 of that number are counted with the dead. Forty of their bodies have been recovered and consigned to graves in the shell reefs, while the decomposing corpses of the remaining 45 lie festering in the marshes. Radford was very thickly settled and populous. It boasted its cotton gin, and cotton and cane plantations. It was the head of navigation, and its stores were many, principally those run by J. Paveto, who also operated the gin and turned out annually 800 bales of cotton produced in that section. The other stores were owned by A. B. Smith & Co. and J. Griffith, general merchandise dealers, and other small merchants constituted the commercial community. Cotton and sugar are the chief products of the ridges, which are composed of the richest and most fertile grazing country, and the parish had 8,000 head of cattle and horses, owned by a thriving community. Communication with the outer world was through two steam vessels, both owned in Johnson's Bayou and Radford, while a fleet of trading vessels plied the waters of the bayou.

"At 4 o'clock on Tuesday afternoon the storm descended upon the people, and everybody took to their homes and waited with bated breath the fate which they foresaw as doomed to be theirs. The waters, rising with the wind, swept through the lower stories of the buildings, driving the affrighted people into the attics and upon the roofs. By 10 o'clock at night the first ridge, 12 feet above sea level, was 10 feet under water. House after house fell in, or was swept away, either burying the poor people in the debris or hurling them into the hissing waters. The cotton and the stores next succumbed, and Radford and Johnson's Bayous were destroyed as completely as if an invading army had done the work. The people could only cling to each other and pray for mercy and for the souls of those whose despairing shrieks rang in their ears. For twelve hours the storm raged over the devastated settlements, and then came a lull. Hope revived as the water receded and the storm passed away, and the survivors gathered on elevated points, viewing the scene of desolation around them."

The keeper of the lighthouse at Sabine Pass, who lived with his family in a small brick house near the lighthouse tower, succeeded in getting all the members of the family into the tower before his dwelling was submerged. All were saved. He says:

"By noon the wind, still holding north and east, began to shake our house. The water came up and things were floating around. It was time for us to leave, and with the women and children we took to the lighthouse; the house was going then, and we did not get in the tower too soon, for shortly thereafter the house went to pieces. It was hard work getting to the tower, but we got there. We had no food, no covering, and only three gallons of oil. Everything went with the building. Then the storm increased in fury. The water rose above the top of the lighthouse door, 10 feet from the ground. It entered the tower, and the draught ascending upward kept lifting the trap door leading to the lamp. The trap door was held down by a hundred pound weight, yet it came up so that one of us with the oil had to add our weight to keep it down. If that trap door had given way, the light would have gone out, and who knows how those would have fared also? The spray from the seas, which with the winds caused the lighthouse to tremble to its very foundation, dashed up through the slit, and that slit is 50 feet from the ground."

Captain F. A. Hyatt and William Guy report that they had a singular experience as members of the relief committee, on their way to the Pass. The train in which they were traveling stopped on a dump five miles from the town. The water all round this neck of land, on which was placed the track, was fully 8 feet deep. The hands of Messrs. Hyatt and Guy are blistered from fighting snakes which literally covered the dump for a distance of five miles. There were thousands of water moccasins from the overflowed district taking refuge on the narrow stretch of land, and every step across it had to be fought through the twisting serpents, many of them the deadly stump-tailed moccasins, larger than a man's arm. Wildcats, also, frenzied at the water's fury, rushed pell-mell upon pedestrians, while raccoons and every variety of animal snapped at passers-by with hydrophobic rage. Many times the pedestrians left the dump and swam around the angry reptiles rather than try to pass them. Captain Hyatt alone killed over 150 snakes during his walk of five miles, which consumed about ten hours. Mr. Guy says that no money could tempt him to make his trip over again. In stepping about in the dark he was tripped and thrown by a snake two inches in diameter and fully five feet long.

Earthquakes.

What is known and believed about earthquakes by geologists was condensed into an hour's talk by Professor John S. Newberry, in Hamilton Hall, Columbia College, at a recent meeting of the New York Academy of Sciences. In the course of the lecture, which took an extended range, the character and causes of the recent disturbances on this continent were referred to as likely to be better understood hereafter than at present. The speaker said that although the Charleston earthquake had produced startling effects and killed some people, as an earthquake it was not a very great affair. There was nothing remarkable in its phenomena. There had been earthquakes that had carried off 10,000 and 20,000 and 60,000 persons at once, and 250,000 lives were reported to have been lost in the island of Java in what might be regarded as a single earthquake.

An exhaustive inquiry in regard to the seat and depth of the Charleston earthquake had not yet been made, he continued. From all quarters, inquiries had come to him about the Charleston earthquake. Because he was a geologist he was naturally appealed to for information in regard to the most striking of earthly phenomena, and while he did not assume the title of "Professor of Earthquakes," he felt that he ought to answer the questions as far as he was able. The peculiar terror inspired by these shocks was not lessened by familiarity with them. It was not surprising that a profound sensation had been caused by the Charleston disturbance, and that the statements with regard to it were widely contradictory.

An earthquake is neither a novel nor a mysterious occurrence. It is among the most common of terrestrial phenomena. Not an hour, perhaps not a minute, passes in which some portions of the earth are not vibrating from this cause. An earthquake is a movement caused by the shrinking, from the loss of heat, of the interior of the earth, and a falling in of portions of the crust in consequence. That the interior of the earth is intensely hot is indicated by wells and mines sunk in all parts of the world. Heat increases about one degree Fahrenheit for every 50 feet below the earth's surface. Dr. Newberry gave the temperature of different wells in this country and Europe as demonstrating this, instancing particularly a well in Europe sunk 3,390 feet, at which depth the thermometer indicated 115°, and another a little over a mile in depth, where the temperature was shown to be 131°. There were some exceptions to this rule, but the statement that below 3,000 feet in certain wells it had been found that the temperature declined was a fraud. At the rate that he had indicated, the heat would be so fervent that all substances would be melted. It was believed that the earth's crust was thicker than this would indicate, because the increase of heat might be slower at a great distance from the surface. The heat of the interior was constantly escaping to the surface. Since the outer crust had lost its heat, it no longer contracted.

Mountain chains resulted from readjustments of the earth's surface caused by earthquakes. The folds and fractures seen in every mountain belt could not have taken place without great disturbances, and in every mountain range are evidences of many earthquakes. In the highest mountain ranges, like the Himalayas, the work of elevation is constantly going on. Displacements are constantly taking place all over the world. They occur in paroxysms, and the pressure being relieved, earthquakes follow. As the population of the earth increases, the number of observers increases, and the loss of life is correspondingly greater.

In New England, during the last century, there have been a great many earthquakes. In 1727 the country about Newburyport was shaken up in the same way that it had been at Charleston recently, but the damage was small in comparison. Chimneys and stone walls were thrown down, there were ruptures of the surface, and jets of sand were thrown up. In 1638 there was a great revolution in the topography of the country, and as shown by Brigham in his work on volcanic eruptions in New England from 1638 to 1869, there were 231 earthquakes worth chronicling during that period, besides many smaller ones.

At the time of the shock felt in this city on August 10, two years ago, the Professor was alone in his room in the college. He heard a sound like the rumbling of a heavy wagon in the street, and the buildings shook. In the geological cabinet the marbles were thrown down in the case. In Japan, where there are incessant earthquakes, an extensive system of taking observations has been instituted. It will doubtless be found that the line of disturbance in the Charleston earthquake was parallel with the Alleghanies, and its depth from 10,000 to 20,000 feet. It is not likely that the center of the disturbance was under the ocean, as some supposed, for if it had been it would have caused a great wave. An earthquake wave coming from below often exerted its greatest force on the surface, as in the game played by boys, called "snapping the whip," the last boy felt the effect the most.

The place of disturbance causing the earthquake in Charleston was, in the speaker's opinion, to the westward of that city, and not underneath it. The earthquake was in the old crystalline rocks that underlie Charleston, stretching from the westward. It was reported that there was a slight change in the depth of the water at that place. The area of vibration was probably an ellipse, with the longest line running north and south. It has been estimated that the maximum depth of earthquake disturbances was 8½ miles, and the minimum 2½ miles. The pressure of subterranean reservoirs of water are among the causes of earthquakes. The twisting of chimneys and monuments did not necessarily indicate a gyratory motion in the earthquake. An adhesion of a portion of the base might account for it. Explosive earthquakes were probably caused by large quantities of water being brought in contact with molten lava, and steam had played a large, though generally a secondary, part in producing them. Earthquakes are merely incidents in the process of mountain building.

The theories of Sir William Thomson and others as to the great thickness of the earth's crust are now generally considered untenable, and it was believed that it was only about 50 miles in depth. It was probable that the viscous zone acted as a buffer between the liquid interior and the solid crust. The flexibility of the crust showed that it was not of great thickness. The lecturer dwelt upon the proximate causes of earthquakes, such as atmospheric pressure, and said it was not so absurd as some thought to believe that atmospheric conditions had something to do with them.

Why the Compass Went Wrong.

The Orizaba is a new steamer. The compasses are Sir William Thomson's patent. When swinging the ship, the reading of the bearings by one of the officers was always different from that by other officers. This led to a wordy contention, the officer maintaining that his reading was correct. The difference was at last discovered to be due to that officer having on a steel truss. These compasses are so sensitive that they are affected by such very minute disturbing influences. The officer had to go on shore and provide himself with a truss constructed free of iron.

A Cliff of Glass.

Among the scientific papers that will appear in the appendix of one of the forthcoming reports of the Geological Survey is one by Professor Joseph P. Iddings upon the obsidian cliff of Yellowstone Park. This cliff is an elevation half a mile long by from 150 to 200 feet high, the material of which, Professor Iddings says, "is as good a glass as any artificially manufactured." Its colors and structure not only make it highly interesting to the visitor, but furnish to the scientific investigator phenomena of importance. The cliff presents a partial section of a surface flow of obsidian that poured down an ancient slope from the plateau lying east. It is impossible to determine what the original thickness of this flow may have been. The dense glass that now forms its lower portion is from 75 to 100 feet thick, while the porous and pumiceous upper portion has suffered from ages of erosion and glacial action. A remarkable feature of the cliff is the development of prismatic columns, which form its southern extremity. These are of shining black obsidian, rising from the talus slope, and are from 50 to 60 feet in height, with diameters varying from two to four feet. The color of the material of this cliff is for the most part jet black, but much of it is mottled and streaked with bright brownish red and various shades of brown, from dark to light yellowish, purplish, and olive green. The brilliant luster of the rock and the strong contrasts of color with the black are very striking. In places, the glass in the process of cooling has been broken into small angular pieces, which have been again cemented by the later flow, producing many-colored and beautiful breccia. In some places, the material shows a fine satin luster, while in others a deep golden sheen is noticeable, which under the lens resolves itself into thin beams of red and yellow light. Through the black and red glass are scattered dull bluish gray patches and bands, and round gray and pink masses, the effect of which is still further to vary the appearance and beauty of the rock, and make it the most conspicuous and characteristic variety of volcanic lava known.

The Proposed French Tower.

The Eiffel tower, 1,000 feet high, which is to be erected in Paris for the exposition of 1889, is likely to afford plenty of excitement to Parisians before it is completed. The first step is about to be taken in ascertaining what curve is to be given to the sides. A chain or cord suspended between two points forms a catenary curve corresponding with the weight. Now it is supposed that something of the kind also occurs when the suspension is vertical. The engineers have therefore arranged to cause a balloon to ascend to the height of the proposed tower. From the boat, ropes will be hung to the ground and fixed there. From their curvature, the contour of the tower will be derived. It is a novel experiment, but, as there is some difficulty in arranging the slope of an ordinary lighthouse, we cannot expect that a colossal tower, made of iron plates, is to be designed without much deliberation.

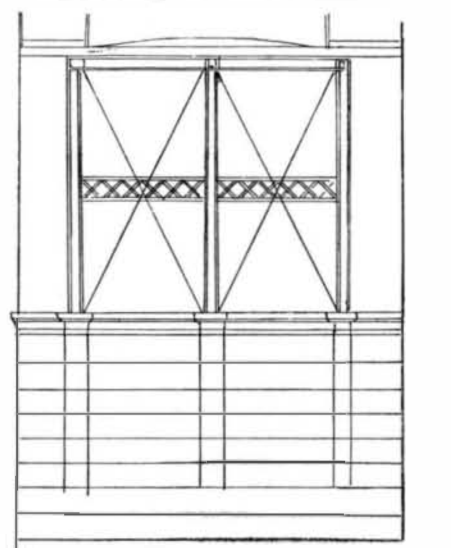
DOUBLE PARABOLIC BRIDGE, SUBMITTED IN COMPETITION, FOR CROSSING THE HARLEM RIVER AT 181st STREET, CITY OF NEW YORK.

BY GEO. ED. HARDING, CIVIL ENGINEER AND ARCHITECT, N. Y.

The main span is to have one clear span of 450 ft., with two end spans of 225 ft. each, composed of low Bessemer steel rectangular braced tube parabola arch, with Bessemer steel linked catenary, braced with the necessary struts and bracing.

The two end spans, where the thrusts and pull of the principal members unite and equalize each other, are anchored down at their respective connections, and so arranged that the necessary lateral movements for expansion and contraction are allowed for.

The iron framed supports which receive the thrust



Section.

of the arch and support the catenary are in longitudinal section that of an isosceles triangle, and have lateral play allowed by resting on bed plates having steel rollers.

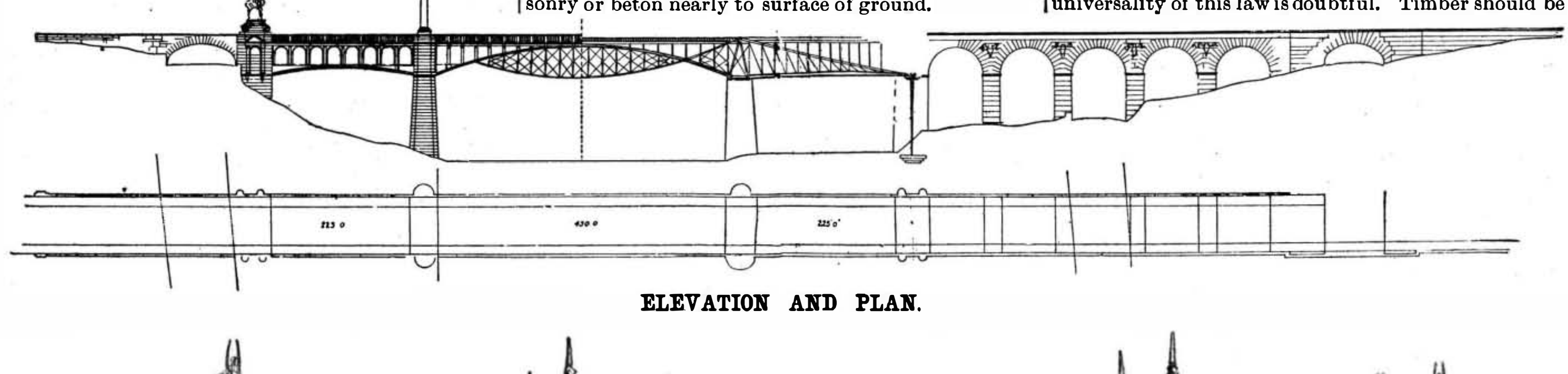
The ultimate strength of the steel used is as called for, viz., 60,000 pounds tensile and 190,000 compression. Elastic limit, 36,000 pounds, with 10 per cent extension.

All rock to be leveled off in horizontal steps when used as foundation.

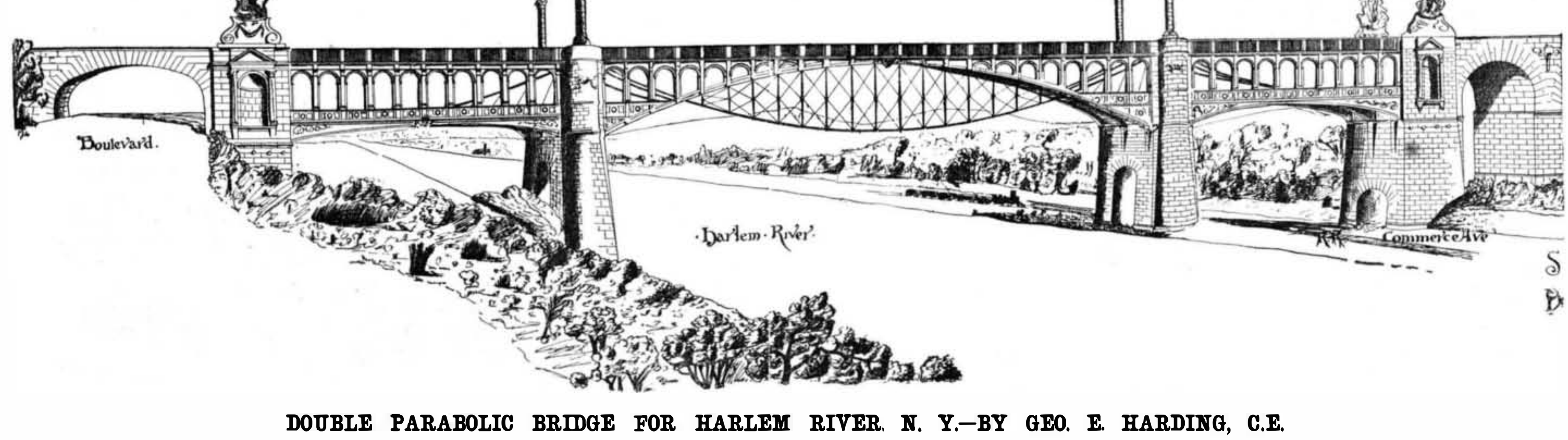
All piers to be faced with granite, 20 to 30 in. thick, averaging 6 and 8 ft. long, with suitable headers binding to the interior stone of limestone, uniform with facing courses.

Piers for the approaches not to be solid work, but lightened by interior arches, as explained by details if required.

Foundation for northern piers to be of concrete masonry or beton nearly to surface of ground.



ELEVATION AND PLAN.



DOUBLE PARABOLIC BRIDGE FOR HARLEM RIVER, N. Y.—BY GEO. E. HARDING, C.E.

The coping, cornices, and parapets on the approaches to be moulded as per details, but the general face stone is designed to be rock faced, with draughted joints.

All cement above ground to be best Portland tested cement; for concrete foundations, best American Rosendale or Taylor's, with clean 2 in. broken trap.

The ornamental arches covering the parts of the main span and the two side spans, as shown in the elevations, are to be of best quality cast iron, carefully painted with one coat of metallic paint before delivery, and to have two additional coats of best Atlantic Mills lead before the final coat of Sienna lead, with tints as desired.

The entire metal work of the bridge to have four coats of best paint, as directed by the chief engineer.

Ornamental railings on the out and inner sides of sidewalk over the three central spans and on the inside of the walk on the approaches (the stone parapet there being on the outside), with posts, to be of best cast iron, selected pattern.

The roadway to be as called for, of corrugated steel plates, concreted with a cover of Trinidad asphalt, with Belgian block granite paving. Sidewalks similarly arranged with bluestone tiles and marble borders.

The designated weight of 200 pounds per square foot distributed load above the full weight of the superstructure, with the live load of 100 pounds and the wind pressure of 400, has been allowed for in the sections.

The entire strutting of the superstructure is also to be of Bessemer steel, and also the main floor girders.

Bracing, wind ties, and anchorage links to be of best quality Swedish wrought iron.

The four ornamental groups of figures at the beginning of the approaches to be of bronze, are alike, and consequently have been estimated at $10,000 each.

Characteristics of Good Timber.

There are certain appearances which are characteristic of strong and durable timber, to what class soever it belongs. 1. In the same species of timber, that specimen will, in general, be the strongest and the most durable which has grown the slowest, as shown by the narrowness of the annual rings. 2. The cellular tissue, as seen in the medullary rays (when visible), should be hard and compact. 3. The vascular or fibrous tissue should adhere firmly together, and should show no wooliness at a freshly cut surface, nor should it clog the teeth of the saw with loose fibers. 4. If the wood is colored, darkness of color is in general a sign of strength and durability. 5. The freshly cut surface of the wood should be firm and shining, and should have somewhat of a translucent appearance. A dull, chalky appearance is a sign of bad timber. 6. In wood of a given species, the heaviest specimens are in general the stronger and the more lasting. 7. Among resinous woods, those which have least resin in their pores, and among non-resinous woods, those which have least sap or gum in them, are in general the strongest and most lasting. 8. It is stated by some authors that in fir wood that which has most sap wood, and in hard wood that which has the least, is the most durable; but the universality of this law is doubtful. Timber should be free from such blemishes as clefts or cracks radiating from the center, "cup shakes" or cracks which partially separate one annual layer from another; "upsets," where the fibers have been crippled by compression; "ringdalls," or wounds in a layer of the wood, which have been covered and concealed by the growth of subsequent layers over them, and hollows or spongy places, in the center or elsewhere, indicating the commencement of decay.—*Professor Rankine.*