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 Monthly (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.

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JANUARY 16, 1904.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

PROPOSED RECONSTRUCTION OF THE BROOKLYN BRIDGE.

It has been for some time a matter of common knowledge that the Brooklyn Bridge is unequal to the present heavy duty that is laid upon it. Although there is no actual danger of collapse, there are certain elements in the design and construction which are continually giving evidence of weakness. This is particularly true of the floor system, in which is included the stiffening trusses. The latter are giving continual trouble by buckling in the lower chords under heavy concentrations of traffic. In saying this we cast no reflection upon the designers and builders of the original bridge. Considering its unprecedented size, the Brooklyn Bridge must ever be regarded as the pioneer structure in the class of extremely long-span bridges. The theory of bridge construction was not so well understood than as it is now. The structure has done noble work in the twenty years of its life, and in the latter half of that period it has been carrying far greater loads than it was originally designed for. The late Commissioner of Bridges, Mr. G. Lindenthal, has left on record in his office a most valuable preliminary study for the reconstruction of the bridge with a view to eliminating its faulty features, enlarging its capacity, and dividing up the duty of the bridge, so that all parts shall take their proper share of the load, and the stress be so distributed that there shall be no uncertainty whatever as to the work that each part has to do.

The chief faults of the original design are, first, the presence of diagonal wire rope stays running from the stiffening truss back to the top of the towers, to which they are rigidly attached. The sagging of the main cables, under a combination of high temperature and congested traffic, throws the greater part of the load on these diagonal stays, with the result that the trusses are strained beyond their strength and are continually buckling out of shape. Secondly, the stiffening trusses are altogether too shallow to be of any great service, some of them having a depth of only 12 feet on a span of 1,600 feet. The main cables have always been the most satisfactory element in the whole structure, for they have a margin of strength beyond the maximum load, that is much greater than the margin in other parts of the structure. In the proposed reconstruction it is sought not only to bring the stresses in each part of the structure within known limits and keep them there, but also to increase the carrying capacity of the whole structure.

Briefly stated, the desired end is accomplished by the removal of the present shallow trusses and the substitution of a pair of great continuous stiffening trusses, 75 feet deep at the towers and 19 feet deep at their shallowest portion in the center of the main span. These will extend across the main span and half way across the two shore spans, terminating at each end at a steel holding-down pier, by which the inshore, overhanging portions will be tied down to a mass of masonry at the ground level, of sufficient weight to counterbalance the excess weight of the main span portion of the trusses. The total length of this great truss will be 2,628 feet, the length of the portion spanning the East River being 1,595 feet 6 inches and that of each of the overhanging shore arms 516 feet 6 inches.

It is designed that these stiffening trusses shall carry their own weight, neither more nor less—the live load, that is the elevated cars, trolley cars, etc., and the load of the floor system, being carried by the main cables. In view of the fact, however, that the stiffening trusses will be built as part of the floor system, and will be rigidly attached to the same, it would seem at first thought as though this division of the load would be impossible. It will be accomplished, however, by a very ingenious method, which consists of cutting out a section of the bottom chord at the towers and placing between the abutting ends a hydraulic plunger which is maintained under a pressure exactly equal to that due to the load of the truss itself. Consequently, when the cables begin to bend under an accumulation of live load, there is no additional load thrown upon the trusses, for the reason that the hydraulic plunger begins to yield, thus maintaining the predetermined stresses throughout the trusses.

The relieving of the cables of the great weight of the present six stiffening trusses and making the two substituted trusses carry their own load, renders it possible to admit a much larger live load upon the bridge, and this is done by providing two decks, on the upper of which will be four elevated railway tracks, and on the lower deck two trolley tracks, two 17-foot roadways and two passenger footways. The roadways will thus be restored to the full width of the roadways on the present bridge before the trolleys monopolized a third of the space. The trolleys, being separated from the roadways, can run at twice the average speed that obtains at present, while there will be a clear gain of two new elevated tracks.

The diagonal suspenders, which have been the cause of so much trouble in the past few years, will be entirely removed, and the load upon the towers lightened by the amount of their aggregate weight. The weight of the big stiffening trusses, moreover, will not rest upon the towers, but upon steel piers which will be built inside the hollow spaces of the towers and will rest directly upon the masonry foundation below. The floor system will be entirely reconstructed, the present narrow latticed floor beams being replaced by plate-steel floor beams and stringers of approved modern construction. The wire-cable wind bracing will be removed, the new trusses and their lateral bracing being designed effectively to sustain any possible wind pressure. In order to take care of the increased pull on the anchorages due to the larger live loads that will be carried, the anchorages will be increased in size, a considerable addition of solid masonry being made at the shore ends. Moreover, to prevent any settlement or sliding, steel sheet piling is to be driven entirely around the base of the anchorages.

It will be very gratifying to the citizens of Greater New York to learn that by the proposed scheme of reconstruction not only is the life of the great Brooklyn structure indefinitely prolonged, but its usefulness and capacity are increased over fifty per cent. Unfortunately the reconstruction cannot be taken in hand until the new Manhattan Bridge is completed. The plans for this structure, which call for eye-bar cables, were drawn particularly with a view to expeditious erection; and if the work is put in hand at once, the bridge should be ready for use in three and a half years from the present date. There will be some slight interference with traffic during the reconstruction of the present Brooklyn Bridge, but the plans have been so drawn that the bridge will be in practical service during the whole period of reconstruction.

The numerous plans accompanying the report on this work will be found in the current issue of the SUPPLEMENT.

LUNAR SUPERSTITIONS.

In his recently published book on the moon, Prof. W. H. Pickering presents an interesting account of the superstitions in which the moon plays an important part.

Probably even in prehistoric times men have noticed the face of the "man in the moon." Plutarch noticed it and even wrote a whole book on the face. But besides this, many other objects are supposed to be visible. The dark markings on the surface are likened by the Chinese to a monkey pounding rice. In India, they are said to resemble a rabbit. To the Persians, they seem like our own oceans and continents reflecting as in a mirror.

The size of the moon, as seen by different persons, varies from that of a cart wheel to a silver dollar. To many it seems about a foot in diameter, from which Prof. Young concludes that to the average man the distance of the surface of the sky is about 110 feet. It is certain that artists usually represent the moon much too large in size in their paintings. Occasionally they represent it in evening scenes with the horns turned downward instead of upward, whereas they must always point away from the sun. The true angular size of the moon is about half a degree, so that it can always be concealed behind a lead pencil held at arm's length.

From the earliest times it has been a source of speculation why it is that the sun and moon, when rising or setting, appear to most persons from two to three times the diameter that they have when near the meridian. As a matter of fact, the sun is slightly and the moon measurably smaller when near the horizon, because they are further off than when overhead. The true explanation, according to Prof. Pickering, is twofold. Human estimates of angular dimensions are dependent not merely on the various dimensions themselves, but also on extraneous circumstances. The case is analogous to our estimates of weight, which are dependent primarily on the real weight of the object, but secondly upon its bulk. Thus a pound of lead feels much heavier than a pound of feathers. One circumstance affecting our estimates of angular dimensions is the linear dimension of the object itself. Alhazen, who died 900 years ago, showed that if we hold the hand at arm's length and notice what space it apparently covers on a distant wall, and then move the hand well to one side, so that it is in front of some very near object, we shall find that it will appear to us decidedly smaller than the part of the wall which it previously covered. An analogous effect causes the full moon, when rising or setting, to appear larger than when it is well up in the sky. On the horizon, we can compare it with trees and houses and see how large it really is. Overhead we have no scale of comparison. The same optical illusion, however, is noticed at sea, so that we must cast about for some additional explanation. Clausius, about 300 years ago, showed that our estimates of size depend largely upon the altitude of the object under consideration. When we pass under an archway or under the limb of a tree, we know that we are nearer the object than we are when we see it at a lower altitude. At the same time, it appears just as large to the average person angularly as it does when we are several feet further away. We are in fact all our lives, as we walk about, used to seeing objects rapidly lifting from their angular positions, yet not appearing as we pass them any larger than they do when we are slightly more distant from them. Thus we always unconsciously make some compensation in our minds for the real changes in angular size that actually occur. If now, the limb of the tree that we pass under, instead of really growing angularly smaller at the low altitude than it was when overhead, should remain of the same angular size in all positions, we should say that it looked larger at the low altitude. This is exactly what happens in the case of the heavenly bodies. Unlike all terrestrial objects, they are practically of the same real angular dimensions when on the horizon as they are in the zenith. Involuntarily we apply to them the same compensation that we are expected to apply to terrestrial objects, and are then naturally surprised to see that they appear larger at the lower altitude.

The majority of the superstitions relating to the moon relate to the weather. Besides, we have the superstition that sleeping in the moonlight, especially if the moon be full, induces insanity. Witness our word "lunacy," in which the belief is expressed. Farmers believe that the moon exercises a certain influence over vegetation, and that beans should be planted when the moon is light and potatoes when it is dark. Many believe that a change in the weather will come at about the time that there is a change in the moon. Prof. Pickering points out that since the moon changes every seven and a half days, every change in the weather must come within four days of a change in the moon, and that changes will necessarily come within two days of a lunar change. This superstition must not be confused with the real, but ill-defined, seven-day period of the weather, which is a genuine phenomenon and holds true to a certain extent. Thus if one Sunday is stormy there is a probability that the several Sundays following may also be stormy. This phenomenon is probably due to terrestrial causes and has nothing whatever to do with the moon.

Some people believe that if the horns of the new moon will hold water, it will be a dry month; that if they are so tipped that the water will run out, it will be rainy. Nearly as many people hold the reverse view. Both views are wrong. The line joining the moon's horns is always perpendicular to the direction of the sun and, therefore, depends merely upon the place of the moon in its orbit.

It has been said that thunder storms are influenced by the moon. Nearly 12,000 observations collected by Hazen in the United States in the year 1884 show a preponderance of thirty-three per cent in the first half of the lunar month. The greatest number of thunder storms come between the new moon and the first quarter; the least number between full moon and the last quarter. This is, perhaps, the only satisfactory evidence that we have that the weather is at all influenced by the moon. Even in this case the effect is so slight that it has only a theoretical interest.

THE PROBLEM OF THE MUTUAL INFLUENCE OF CATHODE RAYS.

In a note read before the recent congress of German naturalists, F. Neesen attempts to show that the absence of a mutual influence of different cathode rays does not depend on an electrodynamical back effect. Two cathode rays from independent discharges were led one beside another in opposite directions and close together, in the same tube, when no effect was observed, though the electrodynamical influence should aid the electrostatical effect.