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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 RELIEF OF THE BROOKLYN BRIDGE TERMINAL.

It must be confessed that the plans which, after six months' work, have been drawn up by the engineers who were appointed to devise the best means for relieving the crush at the Manhattan terminus of the Brooklyn Bridge, are distinctly disappointing to the New York public. Of all conceivable remedies, it was certainly not expected that these experts would seek relief for the Bridge by adding more elevated structures to those which already disfigure the streets of the city and encumber its traffic. When we learn that the so-called improvements (which include, forsooth, an elevated structure down the already-crowded Park Row, across Broadway and down Vesey Street, passing the venerable and sacred inclosure of St. Paul's Church and Churchyard) are to cost three million dollars, the conviction is forced upon us that the disease is preferable to the remedy.

The recommendations, briefly stated, are that an elevated road be constructed connecting the Manhattan terminus of the Brooklyn Bridge with the termini of the two new bridges which are being built across the East River.

That a double-track elevated road be built down Park Row, across Broadway and down Vesey Street, to West Street, and the Cortlandt Street ferry.

That the second floor of the Brooklyn Bridge terminal be used exclusively as a trolley-car terminal; that a new stairway be made to the Bridge from Rose Street; that the present stairway from William Street on the south side be widened and a corresponding stairway be built on the north side; and, finally, that across the whole length of the Brooklyn Bridge the trolley tracks be separated from the driveway by curbing.

With regard to the proposed elevated structures between the three bridges and to the Cortlandt Street ferry, the last-named is, for reasons of unsightliness alone, altogether out of the question. Moreover, we very much doubt whether there is sufficient cross-town travel from the Bridge to the ferry to warrant the construction of a special elevated road to accommodate it. As to the proposition to connect the three bridge termini, it would surely be wiser to await the opening of these bridges and ascertain just what will be the natural flow of travel across and between them, before making any provision to handle or divert that travel on the Manhattan side. The construction of this elevated system would be very much in the nature of a leap in the dark, and as the new East River Bridge, if it is completed under an honest and capable administration, will be opened in less than two years' time, we think it would be wiser to wait at least that long before moving in this matter. So much for the proposed extensions (as they would actually be) of the Brooklyn Bridge trolley lines.

The other recommendations of the engineers, affecting the bridge itself, are, we think, generally to be commended, and the removal of the trolley-track loops to the second floor of the Bridge would be advisable, even if the elevated Bridge extension should never be built. The footway approach to the Bridge would be cleared of obstruction and dangers, and the car and foot-passenger travel would be placed on separate floors. The provision of extra stairways and the enlarging of the present stairways are also greatly needed. The proposition to place a curb for the full length of the Bridge between the trolley track and the roadways, however, is an improvement, the advantage of which would lie entirely with the trolley roads. Its object, of course, would be to prevent vehicles from pulling out onto the trolley tracks, in passing the slower vehicles ahead. At present a swiftly traveling carriage, if it overtakes a heavy dray, has to pull out onto the tracks if it wishes to move ahead. Although

this is done continually, we have noticed that vehicles never remain longer on the trolley tracks than is necessary. Of course, the practice may occasionally cause delay to a trolley car, but the delay is slight and comparatively infrequent. If a curb were laid down, as suggested by the engineers, it would limit the space available for vehicles to 8 feet, and a dray moving at two or three miles an hour would have the whole of the traffic behind it at its mercy for the twenty minutes or more that it takes to cross from Manhattan to Brooklyn.

NAVAL ESTIMATES.

The naval estimates for the fiscal year ending June 30, 1903, call for a total appropriation of just under ninety million dollars. This is about twenty million dollars more than the appropriations for the current year. The principal increases are one of about two and a half million dollars for new construction, and another of two million dollars for armor. Although the Secretary of the Navy, in speaking of the estimate, stated that it did not cover any recommendations for increase of the navy over that already authorized, it is considered probable in naval circles that he will recommend the construction of three new battleships, two armored cruisers and several small gunboats.

It will be remembered that, although the last Congress did not authorize the construction of any new battleships or cruisers, the Construction Bureau was ordered to prepare plans for two battleships and two armored cruisers. The plans for these battleships are those over which such an animated controversy has been waged lately in the Naval Board on Construction, the majority of the Board being opposed to the incorporation of double-decked turrets in these designs, and adopting a plan which included four 12-inch guns in turrets and twenty 7-inch rapid-fire guns mounted in broadside. Plans for the two armored cruisers were also completed. The three new battleships and two armored cruisers recommended by the Secretary will be built from the above designs. If appropriations are made for these five ships, the naval list of the United States will show that we have twenty first-class battleships, under construction or authorized. Compared with the other first-class navies of the world, it will place us second to Great Britain, which has forty-one battleships, while Germany will come third with sixteen, followed by Russia with fourteen, France with thirteen, Italy with ten, and Japan with six. This preponderance in battleships is one of the most encouraging features in any comparison that we make of our standing with that of other navies; for although France and Russia very greatly exceed our navy in the total number and total tonnage of ships of all classes, and Germany about equals us, it must be remembered that it is the battleships that will have to stand the first and last shock of battle, and that by their numbers and excellence must be determined the ultimate issue of a great naval war. The Secretary is in favor, also, of the construction of a dozen gunboats, a type of vessel which, because of its light draft, he considered to be of special value for service on distant stations and in our new colonies.

Among other items of importance in the estimates, we notice the following: For reserve guns for the ships of the navy, \$500,000; for a floating drydock at Portsmouth, N. H., \$500,000; and for new works at the Boston navy yard, \$1,127,700; while for the New York navy yard the estimates call for an expenditure of over \$3,000,000, in which is included \$2,000,000 for the purchase of land, and \$200,000 for barracks for the enlisted men. Over a million is asked for the Norfolk navy yard; the estimates for the naval station at San Juan call for over two and a half million dollars, the improvements including a new masonry drydock to cost a million dollars. Appropriations are also asked for a naval station at Tutuila, Samoa, for the Cavite naval station near Manila, and for a complete new naval station at Olongapa.

It will be observed that a considerable portion of the appropriations is rendered necessary by the enlarged responsibilities and wider field of operations of the navy, due to our West Indian and Philippine possessions. The naval stations are an absolute necessity, for, in case of our being plunged into a naval war, drydocks, coaling stations and store depots would be just as essential to the efficiency of our ships as coal and ammunition. Although the sum asked for is a large one, we must remember that the country is being favored with a period of unparalleled prosperity, and that the increase in appropriations does not begin to equal our expanding commercial activity, and our phenomenal increase in wealth.

VIBRATIONS OF LONDON UNDERGROUND.

The new London underground electric road has been giving considerable trouble of late in the way of vibrations. It will be remembered that the trains circulate, from the City to Shepherd's Bush, in tunnels formed of cast-iron tubes 11 feet in diameter situated at an

average depth of 60 to 75 feet below the street. Since the trains have been running a great many complaints have arisen from the inhabitants of the houses along the route, and it is stated that the vibrations are sufficiently marked to have caused cracks in several buildings. No such effect of vibrations has been noticed for the other underground systems. A special commission was appointed to look into the matter and has lately made its report. The commission, after a careful examination of the locality, is convinced that serious vibrations are produced in a number of houses situated along the route of the Central London Railway, and their experiments lead to the conclusion that these vibrations are due to two causes: first, the too great proportion of non-suspended weight in the locomotives, and second, the want of rigidity of the rails. In order to obviate the first difficulty the company has ordered a new type of locomotive which is shortly to be tested. On the other hand, the engineers are studying the means of giving greater rigidity to the rails. When the results of these tests have been made clear, the committee will be in a position to indicate the measures to be taken in order to suppress the vibrations on the Central London system, as well as the rules to be imposed in the case of new concessions. In any case the committee is of the opinion, according to the present experiments, that by taking special measures the vibrations of the new lines projected on the tubular system may be practically suppressed, but cannot indicate the exact measures to be adopted before the present tests are finished.

MINING CONDITIONS IN SOUTH AFRICA.

Representatives from a large number of mining companies of South Africa have recently arrived in this country, and report that, in all probability, the output of gold from the Transvaal will not for many years equal the amount reached when the Boer war began. In August, 1898, 483,000 ounces of refined gold was produced. The output at the present time is merely nominal. In anticipation of the early cessation of hostilities, and immediately after the capture of Johannesburg by the British, large orders for material were sent by the companies to replace that which had disappeared or deteriorated during the enforced idleness of the war; but the supplies, though received at adjacent ports, have not been forwarded, owing to the continued raids of the Boer forces. The warehouses at Delagoa Bay and Durban are crowded with these shipments waiting for a conclusion of hostilities. Even were there no interruption to railroad traffic, mining could not be resumed at once on account of the dispersal of the laborers, both black and white. In October, 1898, the mines employed 116,000 black "boys" and 10,000 whites, and of these not more than 20 per cent are left. The balance have either disappeared or emigrated.

The condition of the 51 milling plants on the reef which were in operation at the beginning of the war is good. Only one was destroyed, though several of the plants were run by the Boers to provide funds for defensive purposes. Those mines producing the highest grade ore suffered most. The highest number of stamps working was in October, 1898, between 4,000 and 5,000, having increased from 3,567 in 1897.

The value of the surface plants of the mines of the reef is estimated at \$125,000,000, and the cost to place them in as good condition as when closed down is estimated at fully 40 per cent of the original value.

The purpose of the visit of the South African mining agents to the United States is to inspect the latest improvements in deep mining. The introduction of electrical hoisting on the Comstock has greatly interested them, and will lead to the general adoption of this agent as a motive power in South Africa, though cheap water power is not accessible there. The latest improvements in shaft-driving have been sought, and in some instances orders for such machinery have been given.

The agents say there is no improvement in gold-mining adapted to South African conditions that the companies are not prepared to adopt. They admit that their initiative and suggestion of improved mining methods comes from the United States, which supplies them with the latest inventions and most efficient machinery.

It is said as soon as peace is assured that South African mining development will reach enormous proportions. Outcroppings of the Johannesburg extend for a length of 45 miles, with base dimensions of unknown breadth or depth. The "Catlin" shaft, near Elandsfontein, 8 by 28 feet, has been sunk to a depth of 3,750 feet, and is now the deepest in South Africa. It will be continued until the reef is intersected. At its present depth the rock temperature is 80 deg. At Turfontein a diamond drill has struck the reef at a depth of 4,800 feet, and a shaft equal in dimensions to the "Catlin" will be sunk immediately. Projects are being entertained to sink to depths of 10,000 feet, or even more, if necessary. South African engineers are willing to undertake these abnormal projects, provided there is a reasonable assurance of

the existence of ore bodies at these depths. Heat conditions such as are present in the Comstock lode are said not to abound in the Transvaal.

It is said that superficial indications point to the existence of great ore bodies in Rhodesia, and confident assertions are made that the wonderful production of the Johannesburg mines will be exceeded in a few years by those of the newest of British provinces.

FEEDING THE WILD ANIMALS.

The feeding of wild animals in captivity, so that they will thrive and grow contented in their confinement, has become a pretty accurate science in modern times, and the keepers of wild animals in zoological parks, menageries, and circuses, have attained such success in this direction that it is rarely an animal dies because of improper feeding. Twenty-five years ago this was not the case. The mortality among menagerie animals was considerable, and the losses were so great that a systematic inquiry was made in regard to the feeding of wild animals in captivity. Partly as the result of that inquiry, and partly because of the accumulating experience in handling the animals, present methods of feeding have practically eliminated all danger to the animals from the food they may eat.

Yet it has been an easy question to solve. In a wild state the carnivorous animals are gluttons when they can find the food, but their restless activity prevents any troubles from indigestion or over-feeding. Likewise the reptiles gorge themselves with food, and then sleep off the effects for days at a time. In captivity these same tendencies are apparent, but wisdom has taught the keepers not to feed the animals until they were stuffed. This in confinement is not suited to their health. Regular feeding in prescribed quantities has been found the most satisfactory, and the animals are, as a result, kept in much better condition than when roaming wild, gorging themselves with food one day, and starving for a week a little later. If all other conditions of cage life agreed with the wild animals as much as this regular, systematic feeding, the longevity of the creatures would undoubtedly be much greater than their kind allowed to live in their natural habitats, subject to all the uncertainties of food supply.

The feeding of wild animals, birds, and fish in any large park or menagerie is consequently of scientific interest and value. Something less than \$30,000 worth of food is needed annually for the animals, birds, and fish in the public parks, menageries, and aquariums in the limits of Greater New York. A close analysis of the food purchased by this considerable sum shows that the largest amount of the money is spent for meat, fish, and fowl. There are altogether some forty to fifty different kinds of food used, and all of it is as good as the market affords. The common idea that scraps and waste food can be fed to wild animals is hardly consistent with modern menagerie experience. Such food would in a short time cause sickness and disease among the animals in captivity. Hence all the food is carefully selected, and is of the very best. In feeding the animals fish the greatest danger comes from ptomaine poison. Several fine otters and seals have been lost through feeding them with fish that had become tainted. The seals, sea-lions, otters, and pelicans are great consumers of fish, and they are fed every morning with medium-size herring, packed fresh in ice and delivered daily at the Zoological Park. When it is impossible to secure good herring, other fish are purchased and cut up, if too large, to suit the fastidious creatures who live on a fish diet. These fish-eating animals and birds are very susceptible to poor food, and any violent change in the quantity or quality of it almost instantly causes sickness. Probably more sea-lions have been lost to zoological gardens in the past through insufficient knowledge concerning their food than any other class of valuable specimens. The slightest taint of the fish produces symptoms which usually terminate in sickness and death.

The snakes are also very susceptible to the kind of food given them, and they prove extremely fastidious creatures when held in captivity. It is impossible to supply some of the reptiles with the special food they like, and substitutes are not taken kindly to at first. Thus the big cobras in their native haunts live chiefly on other snakes—the small harmless varieties. Now it is manifestly impossible to secure sufficient small snakes to supply these voracious eaters at all seasons of the year. Nevertheless, the keepers of the Central Park Menagerie and the Zoological Park in the Bronx make great efforts to collect small snakes for the valuable cobras. These come from different points in considerable numbers, shipments often amounting as high as 150 at a time. Fed on these lives snakes the cobras thrive in captivity and appear satisfied with their lot; but it becomes necessary to appease their appetite with rats and mice when snakes are scarce. While new cobras will not touch these rodents when

they are first placed before them, they can sometimes be enticed to swallow them when tied to the tail of a small snake or even when stuffed in the skin of a dead reptile.

The other snakes are fed mostly on toads, mice, and rabbits. Even English sparrows are purchased in considerable numbers for the reptiles. The average prices paid each year for these snake foods are two cents each for sparrows, four to five cents each for toads and frogs, and two to three cents for live mice. At these quotations many boys make quite a little pocket money, and the Zoological Park managers find the supply at times greater than the demand, so eager are the youngsters to feed the snakes. In the winter season, however, it sometimes becomes a question of considerable importance how to secure fresh food for the reptiles. At one time more than a dozen rattlesnakes had to be killed because of the keepers' inability to find plenty of live mice to keep them from starvation.

The wild carnivorous animals of the jungle need a certain amount of meat each day, and if they had their tastes always gratified they would accept nothing else; but stale bread is fed to them in addition to the meat. The bears, monkeys, and other beasts of the jungle learn to eat bread with evident relish, but the lions and tigers look forward eagerly to their fresh meat, and are not satisfied until it comes. About the usual feeding hour each day these creatures grow restless and pace anxiously up and down their cages. The appearance of the keeper with their dinner is a signal for whines and growls, and when the fresh meat is thrown to them they snap and snarl surlily until they have disposed of it. Horse flesh has been found an excellent meat for these animals, and a cheap food at that. It probably forms the principal diet of the lions and tigers in Central Park, while the Zoological Garden bears receive a limited amount of "chuck" beef every day.

There is a great variety of food given to the other animals, and the mess department of the Park is an interesting place. There the cooks are preparing for the apes and monkeys custards and puddings made out of tapioca, oatmeal or rice; chopping meat and fish for the aquatic turtles, and preparing vegetarian compounds for the land tortoises. There are great quantities of cabbages, melons, squashes, and lettuce piled up for daily use for a long list of creatures which never touch any flesh or insects. The birds have immense granaries where hemp, rape, and other seeds are stored. Every morning a butcher delivers at the storage house a huge basket of chicken heads, which have been chopped off in the markets for use at the menagerie. These fresh heads are fed to the foxes, which eat them greedily, and to some of the small carnivora. Roots and vegetables and fruits of all kinds are collected there. These are fed to the elks, deer, buffaloes, birds, monkeys, and many other creatures to keep their systems in good order. They represent a sort of medicinal food to counteract any evil effects of the heavier diet.

Hay, oats, wheat, and corn naturally form a considerable part of the daily diet of the elephants, rhinoceri, hippopotami, and similar herbivorous animals. Only the very best hay and grain in the market are purchased for this purpose. The annual bill for hay, straw, wheat, bran, middlings, and meal for the ruminants amounts to something like \$2,600 for the New York Zoological Park; and for meat, fish, and fowl heads, \$3,500. Live fowls, rabbits, sparrows, mice, rats, frogs, and fish for the reptiles cost about \$2,400, and a similar amount is required for seeds, fish, meat, vegetables, and grain for the birds. Over \$1,200 is spent for nuts, seeds, grain, bread, and dog cakes for the rodents, and \$1,850 for bread, milk, fruit, eggs, and vegetables for the apes and monkeys. The annual diet costs the Park about \$14,000, while that for the animals and birds in the Central Park menagerie costs \$12,000. The food for the Aquarium costs about \$2,400, and the few animals kept in the Brooklyn parks are maintained at an annual expense of less than a thousand dollars for the food.

G. E. W.

ROOF GARDENS ON PRIVATE HOUSES.

The Hospital calls for the construction of glass-roofed rooms at the tops of private houses, where children may receive the benefit of open-air play free from the dust and dirt of the street. It says:

"The desirability of children passing a considerable portion of their time in the open air is manifest, while unfortunately it is equally manifest that in most cases town children cannot obtain fresh air without inhaling the foulest of dust. Infinitely better would it be for a child to play about in its roof conservatory, as it could do for hours every day, than to take its perfunctory 'walk' or be wheeled through the London streets at a level of only about thirty inches from the ground. We notice that at a recent meeting of the American Pediatric Society, Dr. Northrup reported that by his advice a sun-room had been

built on the roof of a private house in New York, a playroom in which fresh air and sunlight can be enjoyed without dust, and free from the dangers of the streets, and that the family for whom the structure was built had had the satisfaction of finding that their child, who had been very delicate, grew up strong and well. But our suggestion is not merely to build a playroom on the roof, but to make this glass-covered room itself form the roof of the building, much as a weaving shed is made to form the roof of a mill in the textile factories in the north of England."

SCIENCE NOTES.

The committee having in charge the awarding of the Pollok prize has decided that none of the devices shown at Havre are worthy of the large award. Therefore there will be another competition held at some future date.

Petrolan, says Parfumeur, is a mineral soap, the active principle of which is an ichthyol-like compound. It occurs in bituminous rock in the Caucasus, is of a dark color and of the consistence of an ointment, soluble in ether, and does not turn rancid. It finds application in the treatment of diseases of the skin, such as eczema, acne, psoriasis, etc. It acts as an antiseptic and drying agent without producing irritation of the skin.

M. Santos-Dumont made another flight on October 19 and made the trip from St. Cloud around the Eiffel Tower and return in 30 minutes 40 4-7 seconds. As the guide rope was not seized at the starting point until this time elapsed, he really lost winning the Deutsch prize by a technicality, as the trip only took twenty-nine minutes, thirty seconds. It is possible that the technical committee, which meets October 22, will award him the prize, which is morally his already.

The Kress airship was tested at Tullnerbacher, Lower Austria, a few days ago. The air ship was propelled by a 22-horse power motor. The idea of Herr Kress, who has been working upon the problem for over twenty-five years, was to sail first on the water, and when the propellers drive the airship at a speed of 35 feet a second it would rise and sail in the air. He found on trial that when sufficient speed was reached the airship would rise, but when it was only a few feet above the surface a terrific squall turned it over and it went to the bottom of the lake. Herr Kress had on a life belt and so escaped drowning.

The English Chancellor of the Exchequer proposes the levy of an import tax upon diamonds. It is estimated that the output of the De Beers syndicate in South Africa alone amounts to \$20,000,000 per annum, while a large quantity is also imported from Brazil. Therefore a large sum would be realized, even at 10 per cent, from this source of revenue. The principal difficulty that militates against the maturing of such a scheme is the collection of the tax, but it is anticipated that this difficulty will be easily overcome. It is stated that the result of such a tax will be to drive the diamond-cutting industry to the Continent of Europe. The major portion of the diamonds dispatched to Britain are in their raw state, and it is not expected that the cutting firms would pay 10 per cent upon the raw material, but would establish markets for their goods upon the Continent where no such taxation exists. The Continental retailers would also have the advantage of being able to dispose of their goods 10 per cent cheaper than the English vendor.

Dr. Allan Sturge delivered a very interesting address before the British Association for the Advancement of Science held at Glasgow, on "The Stone Age of Man and his Coexistence with the Ice Age." After alluding to the researches of Archbishop Ussher and Prof. Flinders Petrie, he recounted his own investigations on the subject. He exhibited some stones that he had himself discovered, and which he estimated were fashioned thousands of years before patination occurred. Patination, he explained, alone takes thousands of years to mark the stones in the manner in which those he had discovered were marked. The scratches on the stone he adduced to the effect of ice, and the flint must have been fashioned by a paleolithic man some thousands of years before those glacial epochs which come round once in every 20,000 years. An interesting discussion followed, mainly led by Dr. John Evans, the celebrated archeologist. Dr. Evans severely criticised Dr. Sturge's theories, and explained away the supposed patination marks as due to the chemical constitution of flints; the peculiar strata in which they had been found; or possibly its utilization by the paleolithic man for scraping oily matter from animals' skins, by which means the flint had become impregnated with sufficient oil to permit it to resist patination for an interminable length of time. He also endeavored to point out that the scratches supposed to be due to patination were not actually the results of the action during the glacial period, but were due to the presence of sand.