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, SEPTEMBER 26, 1903.

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.

LIFE IS LONGER UNDER MODERN CONDITIONS

At a recent session of the International Congress of Actuaries, held in this city, the comforting fact was brought out that the improved conditions of modern life, as shown by statistics of the insurance companies extending over half a century, have resulted in a decided increase of the length of life of the average individual. The actuaries are men of the very highest professional ability and their conclusions are based, not upon limited observation, as is so often the case where important deductions are drawn from statistics, but upon a vast accumulation of insurance data and upon a careful analysis of the census. Hence their conclusions may be accepted as perfectly reliable and accurate. Mr. C. L. Landre, of Amsterdam, in speaking of the results obtained in his country, stated that it was remarkable how very constantly the insurance statistics show the expectation of life is increasing, the increase of the maximum of the expectation of life having risen from 46.1 to 56.4 years for men and 48.6 to 57.8 years for women. Mr. C. G. Warner stated that the results obtained in Great Britain show that whereas in 1838 the annual rate of mortality of men for all ages was twenty-three per thousand, in 1900 it had fallen to nineteen per thousand; while for women it had fallen in the same period from twenty-two to seventeen per thousand. The same authority stated that the distinct decrease in mortality as the nineteenth century progressed was so symmetrical as to indicate a settled and permanent tendency. The curious fact was brought out that the most marked improvement is shown in the early years of life. From four years of age up to thirty-four the improvement is so steady that it must be regarded as the direct result of law, while the same fact holds true of female mortality for a decade longer, or up to the age of forty-four, and in a less decided degree for the male. After this age there are periods through which the ratios are at about the same level, and in the later epochs of life there is an evidence of retrogression. During the first years of the great national prosperity that marks the nineteenth century, the effect in the lengthening of life was not marked, for prosperity was "not a little heartless." But in later years humanity and philanthropy had left their mark in the growth of hospitals and organizations for the care of the poor and suffering, while contemporaneously there was a great advance in hygiene and surgery, which also helped to extend the period of life. These developments have acted with more marked beneficial effect on childhood and youth than they have upon middle age; for in the later periods the intenser strain and keener competition which characterize modern life, its higher pressure, and special forms of diseases, are causes of mortality from which the earlier periods of life are exempt.

ELEVATED AND TROLLEY TRACKS ON THE NEW BRIDGES.

The bridge commissioner has recently submitted to the mayor of this city a comprehensive plan for connecting the new bridges over the East River with the surface and elevated roads in Manhattan and Brooklyn. The subject is of such vital importance to Greater New York, and indirectly, as an object lesson in transportation, to the country at large, that we present herewith a brief digest of the commissioner's suggestions.

In the first place it is recommended that the Brooklyn Bridge be strengthened and double-decked, the present elevated and bridge cars being carried on the upper deck and the trolley cars removed from the roadway and run upon the lower deck between the trusses. This would facilitate trolley traffic, and the general vehicular traffic would have the roadways entirely to itself. The trolley tracks will expand into ten loops beneath the new station, which is to be built at the City Hall. The elevated trains also will travel around a loop at the new City Hall station and return over the same bridge to Brooklyn, there connecting with the Fulton Street and Flatbush and Myrtle Avenue elevated tracks.

The new Manhattan Bridge adjoining the Brooklyn Bridge will be utilized by carrying the Flatbush Avenue railroad across the structure to Manhattan. This line will pass over the Second, Third, Sixth, and Ninth Avenue elevated railroads to the North River, thus tapping these north and south lines and putting them in through communication with Long Island, while the Fulton Street elevated railroad will cross by the same bridge, and in Manhattan its tracks will be carried upon an upper deck, above the present elevated structure, through Chatham Square and down Park Row to the proposed City Hall station. This last-named railroad will thus provide a complete loop from Fulton Street over the Manhattan Bridge, back to the Brooklyn Bridge to Brooklyn. Similar trolley and elevated connections are suggested by way of the new Williamsburg Bridge, commonly known as the New East River Bridge, and the commissioner also advocates the installing of the moving-platform scheme which is now under consideration by the rapid transit commissioners. This platform will extend from Williamsburg over the bridge to Manhattan, and in a subway below Delancey Street to the Bowery, then under the Bowery, Park Row and Nassau Street to the Battery. The platform would have a capacity of 70,000 passengers an hour. The elevated railroad tracks on Blackwell's Island Bridge will be connected in Manhattan with the Second Avenue elevated system, while on Long Island connections will be made with the elevated railroads at Thompson or Jackson Avenue.

STEAM TURBINE FOR OCEAN LINERS.

It is persistently rumored that the Cunard Steamship Company has under serious consideration the question of installing turbines in place of the customary reciprocating engines on the two great steamships which it is about to build for the Atlantic service. Our readers will remember that when the question of the construction of these two vessels, which will greatly exceed all existing steamships in size, power, and speed, was finally determined upon, we expressed the conviction that the time was ripe for the introduction of the steam turbine into the Atlantic service, and that there was every reason why this new type of motor should be adopted for these ships. Naturally, before venturing upon so momentous a change, the company will wish that they had for their guidance more extended records of the behavior of the marine turbine, particularly on vessels of some intermediate size between the existing turbine channel passenger steamers and the giant vessels which they are themselves about to build. If the Cunard Company should determine to use the turbine, they will have acted with a great deal of courage and much commendable enterprise; but for our own part, we feel satisfied that the time is ripe for such a venture. The success of the turbine from its first installation in the little "Turbinia" up to the large and fast channel steamer "Queen," has been so pronounced and uninterrupted, that one fails to conceive of any complications which might develop, were the turbine employed on ocean liners, that would prevent the same excellent results from being secured. Indeed, the presumption is rather the other way, for the larger the ship, the better has been the performance; and, indeed, we have the oft-reiterated statement of Mr. Parsons that the greater size of the turbines that would have to be installed in ocean liners would tend toward better results in speed, power, and economy. A strong presumption as to the practicability of using turbine units of great horse power successfully on steamships is found in the fact that the units of 2,000 horse power or more that have been built for electric lighting and power plants have given such excellent service, and the electrical companies are so well satisfied with the results, that they are not hesitating to build units of as high as 10,000 maximum horse power. Now there is no reason why the engine room of a transatlantic liner should present any obstacles to the successful employment of the high-powered turbine any more than it has to the use of the high-powered reciprocating engine. Indeed, the presumption is the other way; for the racing of the propellers, which is liable to have serious results in the reciprocating engine, could, in the nature of things, do but little harm to the perfectly-balanced parts of a large turbine.

MERCHANTS' ASSOCIATION ON CITY TRANSIT.

We have before us one of those voluminous and most carefully compiled reports which are issued from time to time by the Merchants' Association of this city, on questions affecting the municipal welfare of New York. While we have not on every occasion been able to agree with the suggestions of the Merchants' Association, the exceptions have been rare, and in the report before us, which deals with the question of passenger transportation service in the city of New York, the Association has covered the ground most thoroughly and, as a result of its investigations, has drawn up a series of suggestions which, in the main, we heartily indorse.

Reference is made to the public indignation which was aroused last winter by the disregard of public rights shown by the surface and elevated railroad companies of this city. It will be remembered that after public hearings by the State Railroad Commission, a report was filed in which was set forth what might be done to improve existing conditions. After the expiration of the greater part of a year, the Merchants' Association states that the orders of the Commission, as a result of their investigation last winter, although ostensibly complied with by the companies, have not in reality been given such effect as to afford any substantial relief. Moreover, the Railroad Commission has made no serious attempt to enforce its orders, and, indeed, the legal committee of the Merchants' Association has shown that the Commission lacks the necessary legal powers to do so.

After making a thorough examination of the street car systems of Boston, St. Louis, Philadelphia, and other cities, the expert engineers employed by the Merchants' Association have offered the following conclusions and recommendations:

That more cars be put in service during the rush hours, the Committee being satisfied that the number of cars now operated might be increased considerably, even in the busiest hours.

That immediate measures be taken to reduce to the minimum the obstruction to the movement of trolley cars that could be handled, were this done, would be trucks, by building operations, and by other preventable obstructions. It is believed that the number of cars that could be handled, were this done, would be increased fully twenty per cent.

That measures be taken to substitute on all the congested lines cars with a seating capacity of fifty-two passengers each; the present seating capacity of the closed cars on Broadway being thirty on the average.

That a fair trial be given to double-decked cars. This is a suggestion which the SCIENTIFIC AMERICAN made several years ago, and we are still of the opinion that the double-decked car, with ample means for ingress and egress, because of the large number of passengers carried would do more than anything else to relieve congestion in the busiest hours.

The above are the most important recommendations of the report, but it is also suggested that at the principal transfer stations the cars be stopped in sets of two or more; that two motormen be stationed on all cars 28 feet long, or longer, at least during the rush hours of any congested lines, the cars being stopped to take on or leave passengers only at alternate cross streets, which shall be properly designated, and that effective power brakes be adopted.

In conclusion, we draw attention to the comment made in the report upon the plea of the elevated railroad management that during rush hours their cars are only partly filled toward the end of the runs. In reply the Merchants' Association makes a statement which every transportation company in this city would do well to ponder: "Franchises for street railways," says the Association, "are granted for the accommodation of the citizens, and not merely for the companies to make a profit. It is not to be admitted that the companies have any right to run only enough trains to be profitable at all times."

TORPEDO EXPERIMENTS WITH THE "BELLEISLE" BY THE BRITISH ADMIRALTY.

Another interesting experiment has been carried out by the British Admiralty upon the target vessel "Belleisle," which has been the subject of several previous gunnery tests. The object of this latest experiment was to ascertain the effect of a torpedo exploding beneath a battleship, and also the value of cellulose, which is an American material made from corn pith, as a means of preventing the inrush of water into a ship after the penetration of the hull by collision or gunfire. It is contended that the cellulose, if rammed tightly in the double bottom of a ship, would offer resistance to the inrushing water and yet would not expand to a sufficient extent under the influence of water saturation, to burst open the side of the vessel. Previous trials upon a small scale, which were carried out some time ago, substantiated this claim, but the present test was carried out upon a much larger basis, and under conditions closely resembling actual warfare. On the port side of the "Belleisle" a compartment was specially constructed to represent a section of the latest type of armorclad. The compartment was 20 feet in length by 3 feet in depth, and protruded from the side of the target vessel for some two or three feet. Into this section a quantity of cellulose was tightly rammed, rendering it practically solid. A torpedo of the type used in the British navy was lashed alongside this section, and was connected by electric wires to the "Vernon" torpedo training school, a safe distance away. The "Belleisle" was towed to the outer harbor, and moored in 25 feet of water, with a depth of 10 feet below the keel of the vessel. The

torpedo charge was electrically fired from the "Vernon." There was a terrific explosion, and a huge column of water was hurled into the air to a height of some 140 feet. The target vessel was completely buried in spray, which was thrown right over her mast tops. The ship reeled heavily under the force of the explosion, and before the water had settled down she commenced to founder. Arrangements had been made to tow the torpedoed vessel back again into the harbor immediately after the explosion, but the bottom of the vessel was damaged far more extensively than had been anticipated by the force of the explosion, and it was found impossible to tow the battered hulk back again into the harbor in time. The powerful tugs which were in attendance for this purpose thereupon set to work and pushed the foundering ship toward the shore, and succeeded in running her aground on a mudbank, where she was beached. The ship is to be patched up and rendered sufficiently watertight to enable her to be towed back into the harbor, where she will be drydocked in order to enable a minute examination of the damage wrought by the explosion and the resisting qualities of the cellulose to be made. As several portions of the cellulose, however, were hurled into the air, it is apparent that a portion of the specially constructed compartment packed with the cellulose had been blown up also. The exact extent of the damage, however, will not be known until the vessel has been docked.

EUCALYPTS AND THE WORLD'S FUEL.

BY V. E. JLINE.

The world's impending wood famine, which is predicted both by foresters and publicists, is likely to be averted after all through the planting of eucalyptus forests. As a result of the scientific enthusiasm of the late Baron Ferdinand von Mueller, government botanist of Victoria, Australia, large areas in every continent are being planted to this phenomenally fast-growing hardwood genus. Conditions to-day seem to promise fulfillment of his prophecy that "eucalypts are destined to play a prominent part for all time to come in the sylvan culture of vast tracts of the globe." To that prediction this eminent scientist added the significant belief that for hardwood supplies, for sanitary measures and for beneficent climate changes, many of the countries of the earth would have to rely on eucalypts during uncountable periods.

Dr. Alfred James McClatchie, agriculturist and horticulturist in the employ of the United States, says that all who have lived where eucalypts grow can realize fully the force of Von Mueller's prophecy and the great value of the genus to mankind, both present and prospective.

Inasmuch as it is claimed for the eucalyptus that it is the most useful of all trees, it is a matter of considerable scientific and economic interest that the cultivation of the genus in America is being conducted on a generous scale. In fact it may surprise many to learn that the eucalyptus has been planted more extensively in America than any other exotic forest tree.

Among other important things, eucalypts are held by foresters to be unequaled as a forest cover, as windbreaks, as shade trees, as a source of timber, fuel, oil, and honey, and as improvers of climate.

Although only a few varieties have thus far been tried in this country, the success achieved in adapting them to American soil warrants the government scientists conducting experiments in saying that the tree has already served more esthetic and utilitarian purposes than all other forest trees that have been planted on this continent.

Thus far in America experiments have been made only with tropical and subtropical varieties. The genus includes about 150 species, some of them adapted to tropical swamps, others to desert sands, and still others to lofty altitudes.

The fact that they grow rapidly and in a great variety of soils and climates has led Dr. McClatchie to make experiments with a view to utilizing them as forest covers in mountainous and hilly districts and on the plains of America, and particularly for the reforestation of burned districts. He states that the rapid-growing species, less resistant to frost, may be planted on the lower part of mountains, and the somewhat slower growing, more hardy ones farther up the mountain sides. Those adapted to Alpine situations may be planted to a height of from 4,000 to 6,000 feet.

Hitherto in the introduction of eucalypts many mistakes have been made. In southern Arizona, for example, the blue gum does not endure the heat of summer, while in Florida the frosts of winter have been fatal to it. But in some of these places more resistant varieties have been introduced and are growing satisfactorily. Dr. McClatchie predicts that a more careful and systematic study of the genus, accompanied by cultural tests, will undoubtedly result in the discovery of additional and probably better species for these and other regions. He adds that the introduction of heretofore untried species is continuing, and that every year witnesses some new departure in their propagation. The development of these trees is being closely watched by those interested in their planting.

As to the rapidity of growth and consequent value of the eucalyptus as a wood supply, it is interesting to know that when they are five to seven years old, groves of blue gum or manna gum may be cut to the ground for fuel and they may be cut every six or eight years thereafter. The yield from each cutting is commonly from fifty to seventy-five cords of four-foot wood per acre. One seventeen-acre grove between Los Angeles and Compton set in 1880 and cut for the third time in June, 1900, produced 1,360 cords, an average of eighty cords of four-foot wood per acre. In much of the Southwest there is no known species that can take the place of other rapidly disappearing woods and at the same time supply the increasing demand for hardwood fuel. In California the leaves as well as the wood are utilized for fuel purposes. A Los Angeles company is making for market bricks composed of blue gum leaves and twigs mixed with crude oil, and the product is reported to be an excellent fuel for domestic use. The entire tree is thus utilized. This new use of eucalypt leaves suggests to Dr. McClatchie the possibility of many industries growing out of the extensive planting of the trees.

The phenomenally rapid growth of these trees has been demonstrated in the groves of Ellwood Cooper near Santa Barbara, Cal., where blue gums planted twenty-five years ago are as large as oaks whose rings show them to be 300 years old.

Word comes through American consuls that eucalypts seem destined to revolutionize sylviculture in France, Algeria, Italy, Spain, Corsica, Portugal, Cape Colony, and the Transvaal. That the treeless regions of South Africa are being covered with fast-growing eucalyptus forests is a matter of much significance to that new empire of civilization.

The French are reported to be the most active and intelligent in Europe in propagating the tree. Hardly less sanguine than the French are the Spaniards, who hope by cultivating the eucalyptus to secure an ample supply of woodland and wood.

In Australia and the neighboring islands eucalypts are one of the important sources of the general timber supply and are the chief source of the hardwood timber used there. The uses made of eucalyptus timber are remarkably diverse. It enters into the construction of buildings, ships, bridges, railroads, piers, telegraph lines, fences, paving, vehicles, agricultural implements, furniture, barrels, and a great variety of minor articles. In notes on the commercial timbers of New South Wales, Mr. Maiden names twenty-five special purposes for which the timber of eucalypts is used in that colony. Not only in Australia is the timber of eucalypts used thus extensively, but it is exported in large quantities, the bulk of the hardwood lumber shipped being from these trees. R. Dalyrimple-Hay, in his work entitled "The Timber Trade of New South Wales," names thirteen species that furnish timber for export: Shipments are made to distant parts of the globe, including Africa and England.

The piers at Santa Barbara and at neighboring sea towns are maintained with piles of the blue gum. Mr. Cooper has sold from his grove nearly $10,000 worth of piles in the last ten years. At one seaport the superior value of eucalypt piles is reported to have been demonstrated through the surreptitious acts of a contractor. Lacking a few piles of the timber specified in the contract (Oregon pine), he is said to have obtained blue gum timbers from the vicinity and to have ordered the night crew to place them on the inside where their presence would not be detected. When it became necessary to repair the pier a few years ago, sound piles were found among others nearly destroyed, and upon examination they proved to be blue gum trees. The demand for the piles is now greater than the groves of eucalypts can supply. It seems probable that eucalyptus piles may become one of the important crops grown by farmers in some sections of America. As the trees now planted become larger, and as planting becomes more extensive, the eucalypts undoubtedly will prove their value for an increasing variety of purposes. Dr. McClatchie makes it clear that the eucalypts have not been grown long enough in America to have become a source of lumber here. The principal uses made of the timber thus far in America are for fuel, piles, posts, for some of the parts of farming implements, and for pins for insulators on long-distance transmission keys. He adds that the eucalypts deserve to be better known.

In Germany eucalyptus oil is regarded as an excellent remedy in consumption.

Among scientists there is some variety of opinion concerning the effect of the eucalyptus upon climate. Dr. McClatchie sums up the controversy by stating that when the nature and habits of the trees are considered, it is entirely reasonable to believe that they have an effect in benefiting the atmosphere in the region of their growth. His grounds for this belief are: First, their great capacity for absorbing moisture from the soil and thus reducing the quantity of stagnant water in the ground at their roots; second, their corresponding power of giving off fresh from their foliage the water thus taken up; third, the exhalation from their leaves and other parts, of volatile oils, which affect the climate not only directly but by changing the oxygen of the atmosphere to ozone; fourth, the purification of germ-infested matter by the foliage dropped upon the ground or in pools of stagnant water.

Notwithstanding the tree's capacity for absorbing water some varieties thrive on arid plains. At the close of the season of 1900, the driest one of which the Weather Bureau has a record, trees of several species of eucalypts were observed growing without irrigation in Southern Arizona, and some of them had not been irrigated for many years. Trees of the red gum (*E. rostrata*), the sugar gum (*E. corynocalyx*), and of *E. tereticornis*, growing in a neglected tract under desert conditions where the ground water was about 100 feet below the surface, endured the above trying summer.

SCIENCE NOTES.

A second specimen of the African quadruped known as the okapi, discovered by Sir William Johnston, has been secured by Mr. Walter Rothschild for his extensive zoological museum at Tring (England). A special expedition was organized in Central Africa to secure a specimen from Congo Forest, dead or alive. That which has been received by Mr. Rothschild is the skin and skull of an adult okapi.

A Russian doctor named Loudon, of St. Petersburg, has published some interesting observations relative to the action of the Becquerel rays on the nervous system and on the eye. He found that when a box containing bromide of radium was placed in a cage in which mice were kept the animals became paralyzed and comatose, and died in five days. He also found that persons who are either totally blind, or have only the feeblest possible perception of light, are peculiarly sensitive to the Becquerel rays, and are able to form visual conceptions of the contour of objects the shadows of which are shown on a screen by means of the rays.

The Russian Naval Department some time ago dispatched Lieut. Bolsher, of the Imperial navy, to France, to study the question of the utilization of balloons for reconnoitering and other operations for naval purposes. Lieut. Bolsher has completed his investigations, and as the result of his observation he is to carry out a series of experiments as follows: Increase of the radius of action of wireless telegraphy by balloons; signals by balloons by day and by night; night reconnaissances by the aid of balloons; reconnaissances by the aid of free balloons; motion of free balloons at an angle of 70 deg. with the direction of the wind by means of the apparatus devised by M. François Hervé, which was employed so successfully in the Mediterranean; and lastly, measures to be adopted in connection with the ascent and descent of balloons by sea and land.

The French Admiralty has been carrying out a series of experiments to ascertain the effect of torpedo explosions in the proximity of, and from firing of torpedoes from, submarines. For these trials the submarine boat "Naïade" was employed. In the first test several sheep were placed in the vessel, which was submerged outside Cherbourg Harbor. A number of torpedoes were then exploded at distances varying from 90, 120 to 150 feet from the submarine. When examined the sheep were found to be apparently unaffected by the force of the concussion. The members of a special commission and the crew then embarked on the "Naïade," and fired torpedoes from the submarine at the target only some 180 feet away. The results were excellent, but the explosion of the torpedoes entailed a severe strain on the hull of the vessel. From these experiments it is concluded that firing at short ranges does not militate against the habitability or navigability of a submarine, and the results being more deadly, short range is to be preferred to long-distance firing.

A French botanist in the course of his explorations a few weeks ago in the sandy plains of the French Congo discovered a plant, the bark of the many radiating roots of which contained a large quantity of fibrous rubber. At the time scarcely any attention was paid to the discovery, but owing to the present scarcity of rubber and its high commercial value, which is in reality so prohibitive as to prevent a very wide employment of the substance, attempts are being made in England to turn this new discovery to commercial use. The plant also thrives profusely in northern Nigeria, and it is these forests which are to be exploited. A sample of the plant has been analyzed by the botanical authorities of Kew Gardens, London, and these investigations show that the rubber exists in the roots in sufficiently large quantities to warrant development. The name of the plant is *Landolphia Thrallonii*. It is to be found in many places on the west coast of Africa. One firm which is already engaged in the manufacture of this rubber is placing it upon the market at 75 cents per pound, and it is in every respect equal to the ordinary rubber.