SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York

FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year, for the United States or Mexico.................... $3.00
One copy, one year, for Canada.. .... 3.75
One copy, one year, to any foreign country, postage prepaid, £0 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS

Scientific American (Established 1845) ....$3.00 a year
Scientific American Supplement (Established 1876).............. 5.00 "
American Homes and Gardens.. 3.00 "
Scientific American Export Edition (Established 1878)........... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, AUGUST 17, 1907.

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.

CONCRETE AND CUPIDITY.

The recent fatal collapse of the Bridgman Building in Philadelphia, which took place while it was yet under construction, sounds another warning as to the great perils attaching to careless construction of armored concrete buildings, and the growing necessity for the very strictest supervision of such work. Never has the engineer developed a more useful material of construction than when he devised that ingenious and thoroughly scientific combination known as armored or reinforced concrete. On the other hand, never did he open up to the eyes of the unscrupulous and "shoddy" builder such prospects of unlawfully but quickly acquired gain. Intelligently designed, carefully compounded, and put together with due deliberation and proper time allowances for setting and bonding, armored concrete is one of the cheapest and most reliable forms of building construction the world has ever known. But whenever the design is intrusted to incompetent hands, and the construction done by contractors whose sole concern is to rush the work and secure early payments for the same, armored concrete is one of the most perilous materials that could be imagined. Already the ignorance and cupidity which are rampant have succeeded in putting armored concrete under a heavy cloud of distrust, from which it will take many a long year to recover. If the public is not to lose entire confidence, some speedy reform or drastic preventive legislation must be quickly introduced. The design of reinforced concrete, at least in the case of the more important structures, should be restricted to engineers and architects who are familiar with this branch of the arts, which should be safeguarded by laws drawn up for its special protection.

AMBROSE CHANNEL NOW ONE-HALF COMPLETED.

When the new Cunard liner "Lusitania" reaches Sandy Hook lightship, she will be able to enter New York harbor through a channel 1,000 feet in width, 40 feet deep, and 7 miles in length, cut through the outer bar, and extending from deep-sea soundings to the Narrows. This waterway represents the first half of the great Ambrose channel, which the government is excavating with a view to improving the entrance to New York harbor. If the forecast of the army engineers be correct, in about four years from the present time this great work will be fully completed, and it will be possible for the whole of the maritime traffic to and from the port of New York to steam directly to the Narrows through a channel 2,000 feet in width, which will afford a uniform depth, even at low water, of 40 feet. The full-load draft of the largest ships afloat, the "Lusitania" and "Mauretania," is 37½ feet, and as they will rarely, if ever, draw this much, it is reasonable to suppose that the Ambrose channel will be ample for the needs of navigation, at least for the coming two decades.

Outside of engineering circles the magnitude of this undertaking is but little appreciated. When work was commenced on the contract in 1901, there was a minimum depth of 16 feet of water along the route of the channel. Since that time the suction dredges have removed 26,000,000 cubic yards of sand, gravel, and mud, whose total weight is about 40,000,000 tons. The work, which has cost to date about $2,500,000, will have cost by the time it is completed fully $4,000,000. The two large dredges now engaged on the work cost $400,000 each, and the government proposes to build two more of equal, if not greater, capacity. For the present, the 1,000-foot channel will be restricted to the use of ships drawing 29 feet and over, this arrangement being necessary in order to limit the number of vessels using the new waterway while the dredges are completing the unfinished half of the channel.

SMOKELESS POWDER AND AMMUNITION ROOMS.

The many fatal accidents which have occurred during the past few months on naval vessels, chief among which was the disastrous explosion on the French battleship "Jena," have been traceable, directly or indirectly, to smokeless powder. In many cases the accidents have been due to deterioration of the powder, and in all cases they have resulted from the greater risks which attend either the storage of the powder or its manipulation from the handling room to the breech, or even, as in the case of our own "Georgia" disaster, from the action of the gases after the gun has been fired. While the wonderful increase in the accuracy, range, and striking energy of modern naval ordnance has been due to the high ballistic qualities of smokeless powder, the new propellant has brought with it a whole series of risks, which were little dreamed of in the days of black powder and the muzzle-loading smoothbore. These risks commence as soon as the powder is stowed in the ammunition holds; for not only are modern powders more sensitive to heat than those which they displaced, but the conditions which tend to raise the temperature in the ammunition rooms have multiplied very materially in the modern warship. The sensitiveness to temperature and the tendency to chemical decomposition, both elements of danger, are difficult to remedy; since, as far as our present knowledge goes, they are inherent qualities of the high explosives, or combinations of high explosives, which give to modern smokeless powder its wonderful qualities. On the other hand, the risk from overheating of the ammunition rooms is entirely removable; and the French naval authorities, stimulated by the "Jena" disaster, are giving particular attention to this question. It is realized that arrangements for cooling which are entirely satisfactory for holds intended for carrying perishable provisions, are quite inadequate for ammunition storage. The holds of provision ships are not opened during the whole trip; but ammunition holds have to be constantly opened, in accordance with the requirements of a naval cruise. Consequently, simple cooling by ventilation is not sufficient, and the best modern practice recognizes the necessity for refrigerating the air before it is forced into the hold. The French have installed on several French and Russian ships refrigerating plants, in which a refrigerating liquid is pumped between metallic surfaces; on the outer sides of which air is caused to circulate by means of fans. With these machines it has been found possible to maintain the ammunition holds at a constant temperature.

The problem of the powder is more difficult, since it is not solvable by any mere mechanical system. We have not been so much troubled with chemical decomposition as have some of the European nations, and this for the reason that, many years ago, we adopted, in the navy, an all-nitro-cellulose powder, and, in the army, a powder containing only twenty-five per cent of nitro-glycerine. Because of its great energy in proportion to its bulk, European manufacturers have used nitro-glycerine in large proportions, the earlier English cordite being composed of about sixty per cent of this explosive; but they have naturally experienced much difficulty in producing powders that would remain stable for any reasonable length of time. Of late years they have been coming more to the proportions adopted in this country, the present modified cordite having only about thirty-five per cent of nitro-glycerine in its composition. However, even in this country we are experiencing trouble with variation of powder pressure, and this, of course, produces irregularity in the velocity, and therefore in the accuracy of the gun. There is still a demand for a powder that will combine with high ballistic qualities absolute stability in storage and unvarying pressure in the powder chamber.

ROUTE OF CATSKILL AQUEDUCT CHANGED.

As one result of the present extensive surveys, it is probable that an important change will be made in the route of the Catskill aqueduct on that section which extends from the Ashokan reservoir to the easterly shore of the Hudson River. The new route will leave the reservoir at a point near the site of the Olive Bridge dam and further toward the western end of the reservoir. It will extend in a southerly direction, several miles to the westward of the original location, intercepting the Hudson River just above Storm King Mountain. The first location was laid down under the pressure of the necessity of making a speedy choice of some route, in order to comply with legislation which required the Board of Water Supply to file plans with the State Water Supply Commission and secure its approval, before proceeding with the preliminary work. Subsequent surveys have developed the fact that there is no suitable rock for a deep-level tunnel beneath the Hudson River at the proposed crossing. Borings which have been made at various points up and down the river, point to the probability of obtaining unfissured rock in the neighborhood of the Storm King Mountain. Shafts are now being sunk on each side of the river to a depth of about 600 feet below the water surface, and 400 feet below the level at which the aqueduct tunnel reaches the river face of the mountain. When the shafts have reached the desired depth, horizontal test tunnels will be driven across from shaft to shaft—a distance of 2,000 feet—to determine whether the rock is of sufficient solidity and freedom from fissure, to withstand the enormous water pressure of 33 tons to the square foot, which would be exerted against the walls of the tunnel at this depth. If the test tunnel shows the rock to be unsuitable, it is likely that the water will be conveyed in steel pipes or some other form of conduit, laid either upon or at a slight depth below the river bed, at a crossing located a short distance north of the point where the test tunnels are now being driven. A river-bed crossing, however, would be longer than the tunnel and liable to injuries, accidental or malicious, from which the deep tunnel would be protected.

GROWTH OF OUR EXPORTS OF MANUFACTURES.

Over three-quarters of a billion dollars of manufactures passed out of the ports of the United States in the fiscal year which has just ended; and of this enormous total $740,000,000 was sent to foreign countries. A gratifying feature of this trade is the fact that two-thirds of it was shipped in finished form, ready for consumption, and one-third of it in partially manufactured form for further use in manufacturing. Exports of finished manufactures show an increase of about $20,000,000 over last year, and an increase of $267,000,000 over the year 1897; while manufactures for further use in manufacturing show an increase of $34,000,000 over last year, with an increase of $162,000,000 during the past decade. The distribution of this $740,000,000 of manufactures sent abroad last year is instructive. One hundred and eighty-one millions represented the value of iron and steel manufactures, an increase of $20,000,000 over last year, and of this total amount about 85 per cent was shipped in finished form ready for consumption. Exports of manufactures of copper represented $89,000,000, of which $85,000,000 went to Europe. The next largest item was that of manufactures of wood, whose value amounted to $80,000,000, of which $65,000,000 worth was shipped in a partially manufactured form. Next in value was the exports of mineral oils, to the value of $78,000,000, one-half of which went to Europe, one-fifth to Asia, the balance being widely distributed. Of leather and its manufactured products we exported $45,000,000 worth, of which considerably more than one-half went to Europe. Of cotton goods we exported $32,000,000 worth; and agricultural implements represented a value of $27,000,000. Summing up on a basis of distribution, we find that $350,000,000 worth went to Europe; $200,000,000 to North America; $100,000,000 to Asia and Oceania; $75,000,000 to South America; $15,000,000 to Africa; and the remaining balance of $40,000,000 to non-contiguous territories.

A PRIZE FOR THE EXTRACTION OF FLAX.

The New Zealand government has offered a prize of $25,000 for an economical process for the extraction of flax from the native plant, either by chemical or mechanical agency. This plant, which is cultivated in many climates similar to that of New Zealand for its beautiful flower, is entirely distinct from the ordinary plant from which flax is procured. The leaves, which are from one to three inches in width at their broadest part and from two to six feet in length, are of a fibrous nature, and it is from these and not the stalk that the flax is obtained. Bleaching this fiber, however, is a difficult process, owing to the large amount of viscous, resinous, and gummy substances impregnated therewith, and which cannot easily be removed. Consequently, the resultant fiber is only used for the coarser materials, such as sail cloth, where a pure whiteness is not particularly required. The process generally adopted for the extraction of the fiber from the leaves is maceration, but the most efficient and satisfactory, though essentially primitive and slow, is the method practised since time immemorial by the natives. By a deft movement of their thumb nails they remove the thin outer skin from the leaf, and then comb out the fibers with small combs, no macerating process of any description being resorted to. The product thus obtained is of excellent quality, possessing a silky luster and of great strength and durability, and is mostly employed for the manufacture of rope, twine, and mats.

The plant grows very luxuriantly and prolifically, and will thrive in the poorest soils, being found very extensively in a wild state all over the country. When cultivated, three harvests of leaves can be procured