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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.

## A WARNING.

It is quite conceivable that the great loss of property and the equally serious loss of prestige occasioned by the fall of the Quebec Bridge have been already fully compensated by the valuable lessons learned from that disaster. It was worth the loss of a Quebec Bridge to learn that tests of the strength of a small model can no longer be taken as a basis in estimating the strength of a structure which is an exact reproduction of that model on much larger scale. That was the principal illuminating fact brought out by the commission which made an exhaustive examination of the wrecked bridge. Furthermore, it was proved that when the members of a framed structure are themselves made up of a large number of assembled pieces, as in the case of built-up chords, posts, girders, etc., the results obtained on the smaller models are particularly unreliable in determining the strength of the full-size members.

If it be necessary to proceed with caution in the case of a structure in which the assembled parts consist of the same kind of material, possessing similar elasticity and breaking strength, there is a call for even greater caution when the materials of construction are not homogeneous, and the bond between them is of a more or less doubtful character. This last condition exists in the case of reinforced concrete construction, and especially when it is used in the building of truss bridges and similar framed structures.

We are therefore in thorough accord with our esteemed contemporary Engineering News when it draws attention editorially to the construction of a reinforced concrete truss, the strength of which was determined, or attempted to be determined, by the testing of a model of one-tenth the linear dimensions and one-hundredth the cross-sectional dimensions of the finished bridge. Our readers will remember that in the various failures which we have recorded of reinforced concrete, the breakdown has most frequently occurred at the points of junction of one member to another; such, for instance, as the connection between a floor beam and a vertical post. It is admittedly difficult to design these connections in such a way as to render it possible to determine their strength with the same certainty that obtains in designing such a connection in an all-steel structure; and a concrete truss bridge, because of the multiplicity of the joints and the complicated character of the stresses which occur, must be particularly liable to this uncertainty.

We have no wish to throw any general doubt upon reinforced concrete construction as such; but we do believe that now that a determined effort is being made to apply the system to the more difficult problems of bridge work, our engineers should proceed with the greatest caution, and advance only upon well-proved data. The call for testing machines capable of trying out to absolute destruction the largest size members is particularly urgent when these members are built up of such widely different materials as steel and concrete, the strength of the bond between which is greatly dependent upon careful work during erection.

## ELECTRIFICATION OF A CHICAGO RAILWAY TERMINAL.

At a recent meeting of the stockholders of the Illinois Central Railway, the proposal to electrify the terminal lines of that company in the city of Chicago was rejected. The city now proposes to force the hand of the railway company by means of local ordinances. The railway company objects to the change on the

ground, first, that there is a heavy interchange of traffic with other railways that use the Illinois Central terminal, and secondly, that the main line and suburban passenger and freight tracks are all included in the terminal system. Therefore, it would be difficult and enormously expensive to equip the entire system for electric traction, while serious difficulties and dangers would result from the operation of the yard and the switching service by electric traction.

These objections have a familiar sound in the ears of residents of New York city, who have not forgotten the agitation which preceded the wonderfully successful installation of electric traction at the terminal of the New York Central Railroad Company in this city. They are also mindful of the fact that, long before the electric service was in full operation, the Chief Engineer of the railroad announced that the benefits derived by the railroad company itself, to say nothing of its patrons, from the new service exceeded even the most sanguine expectations. Not only was the city freed from the nuisance of smoke and noise, but the railroad company itself was able to handle its trains more expeditiously, and to reduce the number of train movements enormously. Although no definite figures have been given out as to the decrease in the cost of operation, it is generally understood that the reduction has been very considerable.

We confess to considerable surprise that so enlightened a journal as Engineering News should side with the Illinois Central Railway in its present obstructionist policy, which it does by stating that it is "unreasonable to make the objection of the people of Chicago to the noise and dirt from the engines a basis for saddling the railways with the enormous cost of converting the entire terminal system to electric traction."

It seems to us a simple matter of equity that the holders of a valuable franchise should bear the expense of any changes that will render their operations under that franchise as free as possible from inconvenience and nuisance to the city that gave it. The smoke and noise arising from the operation of the Illinois Central tracks by steam, constitute a most serious disfigurement and drawback to the Chicago water front; and the great improvement which resulted from the electrification of the terminal of the New York Central Railroad will be even more marked in the long stretch of water front which is now so greatly marred by existing conditions at Chicago.

## REPORT OF THE NAVAL BUREAU OF ORDNANCE.

We learn from the report of Rear Admiral Mason, Chief of the Naval Bureau of Ordnance, that the tests of the new 12-inch 50-caliber gun showed it to be fully equal to any gun of that caliber thus far proposed for any navy. In the proving ground tests it developed an initial velocity of 3,030 feet per second and a muzzle energy of 52,500 tons. This is the gun that will be mounted on our two largest "Dreadnoughts," the "Arkansas" and "Wyoming" which will carry twelve guns of this pattern. More powerful than this, however, will be the new 14-inch type gun, which will pass through its tests before the end of the present year. It is designed to fire a 1,400-pound projectile with a velocity of 2,600 feet per second and a muzzle energy of 65,600 tons.

It is gratifying to learn that our present nitrocellulose powder has been developed to a point which leaves little room for improvement. Moreover, a new pattern of projectile is now being built, carrying the long pointed head that has been found to give such good results in small arms, which has shown a considerable increase in range, flatness of trajectory, danger space, striking velocity, and penetration at the longer ranges. Our older guns have been modernized, and this work has included the relining and strengthening of the 12-inch guns of our battleships of a date prior to, and including, the "Virginia" class.

The Bureau is much gratified at the remarkable results which have been obtained in target practice with equipment which was designed many years before the present principles and demands of target practice had been developed; and a new system of sighting mechanism has been worked out, and is being applied to all turret guns. Our latest ships are being fitted with complete refrigerating plants for the cooling of the magazines, and the magazines of the older ships are to be similarly fitted as opportunity offers. Changes have been made in the rotation band of projectiles, which will considerably prolong the accuracy life of the projectiles after the gun has been so much worn that its accuracy with the older bands would have been much impaired.

## THE ARMY ORDNANCE REPORT.

In his Annual Report, Gen. Crozier, Chief of Ordnance, U. S. A., speaking of the occasional failures of heavy guns, states that the trouble arises, not from a defect in the design of the guns, but from concealed defects in the forgings or the development of thermal or heat cracks. The danger arises from imperfections

lying within the finished dimensions of the forgings, which are not apparent on the surface, and cannot be detected even by the most thorough inspection. These heat cracks are due to the high temperature of the powder gases, and they increase in depth and number as the number of rounds fired increases. By way of remedy, the Department has decided to reline the guns as soon as these thermal cracks have become very pronounced. Henceforth all seacoast guns of 6-inch caliber and over, except mortars, will be provided with double tubes, so that, should the inner tube give way, the damage will not extend to the outer tube and the enveloping jacket and hoops. This will permit the restoration at small cost of guns whose tubes give way, and will facilitate the rehabilitation of guns whose accuracy has been lost through erosion and wear of the bore.

The six 6-inch and four 14-inch guns authorized by Congress at its last session will be of the wire-wound type and will have these double tubes and in the 14-inch guns the caliber length will be raised from 34 calibers, as in the guns now under construction, to 40 calibers. Within the next few months the Department hopes to test the new 34-caliber 14-inch wire-wound gun and one of the new 12-inch wire-wound mortars.

The construction of hand grenades for our army marks the reintroduction of an ancient form of weapon. They were used with good effect, we believe, in the Russo-Japanese war. The grenade can be thrown by hand a distance of about 100 feet from a standing position. Lieut.-Col. Babbitt has designed a rifle-shrapnel grenade to be fired from the musket carried by the infantry. Troops will be furnished with both the hand and rifle-shrapnel grenades in a reasonable quantity whenever there is a call for them.

Another item of interest gleaned from the report is that Gen. Crozier is of the opinion that the government can now manufacture cheaper than it can buy; that is, if everything is taken into account except the manufacturers' profit. As an instance of this, he quotes the fact that the 3-inch field gun, which under contract costs \$2,029.80, can be manufactured at the arsenals for \$1,276.90; and that the 12-inch disappearing carriages, which cost under contract \$1,568.47, cost only \$605.35 when built at the arsenals.

## THE ORIGIN OF EUROPEAN PEOPLES.

In a recently published work on the origin of European peoples, Sergy recognizes eight races of men, only three of which have left remains in caverns. These races are *Homo Europæus*, *H. Euraficus*, *H. Eurasicus*. The first race is extinct. It was characterized by a very low forehead and an enormous protrusion of the glabella and the superorbital arches, forming a sort of visor. Remains of this race have been found at Taubach, Krapina, Neanderthal, Spy, Schipka, La Naulette, and Malarnand. Sergy assigns the middle of the Pliocene as the period of this race.

The second race is still in existence. It has a visorless skull, dolichocephalic or mesocephalic. It came from the north of Africa and has left remains in the loess of Egnisheim, Galley Hill (England) and Piedmont (Moravia), and in the caves of Langerie, Chanzelede, and Baoussé-Roussé. Sergy ascribes to this race the palæolithic civilization of the later Quaternary in the south of France, and finds in that civilization analogies with the Mycenaean or prehistoric Egyptian civilization, apparently later than the Quaternary but in reality contemporaneous with it in the development of the arts. There is no apparent reason why this race should not have penetrated into the southwest of France.

The synchronism of two ages, however, is very difficult to prove, because the palæontological criterion of the Quaternary is not uniform throughout Europe, owing to differences in climate. For example, no trace of *Elephas primigenius*, *Rhinoceros tichorinus*, or *Cervus tarandus* has yet been found in Italy.

*Homo Euraficus* persisted into the neolithic age at Cro-Magnon, Baumes-Chaudes, Arène-Candide, etc. Toward the end of the neolithic age the third race (*Homo Eurasicus*) came into Europe from western Asia and left remains at Grenoble and Furfoo. This is the still existing brachycephalic race.

The Frankenholtz mine, near Mittelbesesack in the Palatinate, has devised an ingenious but seemingly very uncertain plan for utilizing the fire damp given off in certain of its galleries, much as is done sometimes with hydrocarbon gases in salt mines. The mine has a depth of 500 meters. Before working upon the coal seam at this level, it was deemed prudent to drill to a depth of 50 meters, to discover any possible escape of fire damp. It was found that there was an abundant escape of this dangerous gas. A 1,500-meter conduit was built for drawing the gas to the surface. In June, 1908, the gas pressure was still 12 atmospheres; the idea was then conceived of finding a practical use for the gas and it was decided to use it for heating the boilers feeding the steam engines at the mine. A special plant was installed accordingly.