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NEW YORK, SATURDAY, FEBRUARY 8, 1902.

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.

LESSONS OF THE MURRAY HILL EXPLOSION.

The recent dynamite explosion at Murray Hill, in this city, is one of those unfortunate accidents which, judging from their frequency, seem to be inseparable, at least under existing conditions, from the carrying out of municipal improvements that involve extensive blasting operations in the heart of a busy city. It is certain that accidents due to blasting operations are altogether too frequent, and it is probable that this disaster, like the collision which occurred only a few days earlier in the New York Central tunnel, will lead to a revision of the rules which have been laid down for the protection of life and property, as far as they are affected by this class of work. High explosives, because of their enormous latent energy, are inherently dangerous; for, although by taking the proper precautions, the risk of premature explosion may be reduced to a very low margin, when a disaster does occur, it is liable to be of positively appalling magnitude. On the other hand, unless we are satisfied to see the march of improvement arrested, unless we are prepared, especially on Manhattan Island, to cease the erection of tall buildings calling for deep foundations and put an end to our ever-multiplying schemes for rapid transit and improved communication with outlying territories, we shall have to get accustomed to the knowledge of the fact that dynamite is being carted through our streets, and is being temporarily stored in innocent-looking sheds that are, of necessity, in uncomfortable proximity to the moving throngs and surging traffic of a great city. Although, as we have said, there is an enormous potency for disaster, even in the smaller quantities of high explosives, these substances may be handled and used with perfect safety if only proper rules for storage and manipulation are laid down and rigorously carried out. Cases are extremely rare in the present day in which disastrous explosions of the ordinary blasting agents have been due to chemical decomposition of the agents themselves; almost invariably they are traceable to carelessness or accident in the handling. There is, therefore, no cause for panic on the part of the citizens of New York, or of any other municipality where extensive blasting operations have been carried on. The disaster has shown the necessity for more stringent inspection on the part of the city authorities of the methods of storing and handling high explosives. The lesson for the contractors is that only eternal vigilance can ensure New York against future accidents of the kind during the completion of the subway.

FRAILTY OF TORPEDO BOAT DESTROYERS.

Owing to the innumerable disasters that have overtaken several of the torpedo boat destroyers during the past few months, Sir Edward Reed, the former Chief Designer of the British navy, has urged for a Parliamentary return relative to the character of the tests imposed upon torpedo boat destroyers before the Admiralty finally accepted them, and a report upon the efficiency of this type of war vessel. The government in their return give the names of all the torpedo boat destroyers in the British navy, the dates when they were ordered, and the dates when the boats were accepted by the government, or, in the case of unfinished boats, the expected dates of delivery. Particulars are also furnished of the number of preliminary trials the boats of 30 knots or more undergo, and particulars of typical cases wherein those trials have been exceptional in number, and have been extended over considerable periods.

According to this report, in twenty cases the trials were very protracted, and in several instances the government had to forego their demand for a certain speed, since the boats failed to attain it. The "Albatross," for instance, was ordered in April, 1896, and the trials, numbering seventeen, were spread over a period of six months, chiefly in consequence of alterations made to propellers and other parts of the machinery with the object of reaching the contract speed. The vessel tendered for thirty-two knots, but as she failed to accomplish this speed she was finally accepted at thirty-one and a half knots. The "Express," which has not been taken over by the Admiralty, has already been submitted to no fewer than twenty-seven preliminary and ten official trials, but satisfaction has not yet been obtained. In many cases failure to obtain the required speed has been the cause of the extended trials. Of four thirty-knot boats, one was accepted at twenty-nine knots, and three others at twenty-nine and a quarter knots. One destroyer was tested for six months, after which locomotive boilers gave place to water tube, of which a two months' trial was made, but the boat was finally accepted at twenty-six and three-quarter knots instead of thirty knots. All the new orders since 1900 have required thirty-two knots, but only four of these have been accepted. Altogether sixteen destroyers have yet to be delivered.

The Admiralty has also issued a note of warning to the Admirals in command of the British fleets on foreign stations, urging the more careful usage of destroyers. It is specially pointed out that these frail craft are not fit for the rough work to which they have hitherto been submitted. The Naval Department now directs that they should be treated with more consideration for their structure and capabilities than has heretofore been shown.

SUBTERRANEAN TEMPERATURE.

The driving of the great Simplon tunnel through the Alps is affording some interesting data on the subject of subterranean temperature. The work has progressed in the north heading over 21,000 feet, and in the south heading over 17,000 feet. Temperature observations have been taken both of the rock and the atmosphere. The temperatures of the rock show a steady increase with the depth of penetration in both headings. Thus at 1,640 feet from the portal of the north heading the rock showed a temperature of 54.3 deg. Fah., while in the south heading at the same distance from the portal the temperature was 56.2 degs. At 6,560 feet the temperature in the north heading was 63.6 degs., and in the south heading 69.7 degs. At 12,920 feet from the north heading the temperature was 76.3 degs.; at 15,090 feet it had risen to 86.3 degs., and at 16,400 feet penetration the temperature of the rock was 89.1 degs. The highest temperature recorded previous to September last was 92.2 degs. Fah. Early in October a heavy stream of water was encountered, which temporarily drove the gangs of workmen from the heading and necessitated temporary suspension of work in the main tunnel. The heaviest flow of water recorded at that time was about 200 gallons per second; and while it has been productive of considerable inconvenience in the tunnel work, it brought with it the advantage that it produced a very marked decrease in the temperature of the rock. The temperatures of the air are not given, for the reason that they vary with the amount of ventilation. During the summer it was found necessary to deliver to the northern end of the tunnel 39,000 cubic feet of air, and 66,000 cubic feet to the south end.

THE EAST RIVER BRIDGE FROM THE STANDPOINT OF ART.

Considered from the æsthetic standpoint, the new East River Bridge is destined always to suffer by comparison with its near neighbor, the present New York and Brooklyn suspension bridge. Whatever criticism has been made against the constructive features of the latter structure, it has always been conceded to be an extremely graceful and well-balanced design. It is possible that, were it not in existence, we would not hear so many strictures upon the manifest want of beauty in the later and larger East River Bridge, which is destined to be popular more on account of its size and usefulness than for its graceful lines. As a matter of fact, the East River Bridge is an engineer's bridge pure and simple. The eye may range from anchorage to anchorage, and from pier to finial of the towers, without finding a single detail which suggests any controlling motive, either in its design or fashioning, other than that of bald utility. The bridge is a strain sheet translated most literally into metal. For simple strains of tension or compression the most favorable distribution of metal in the framed portions of a bridge occurs when its members are strictly rectilinear. Speaking in a general way, curved forms, both in the details and in the general sweep of the outline of the bridge (saving, of course, the one great exception of the main cables), while they conduce to the grace and elegance of the structure, almost invariably add to the cost, and weight for weight, diminish the strength of the structure. Hence, pound for pound of material, a bridge which follows most nearly the simple straight lines of the strain sheet will be the most economical in construction. It will also be the most scientific, the most easy to construct, both as regards shopwork and erection, and, in all probability, the most ugly.

Mr. Gustave Lindenthal, the new Commissioner of Bridges for New York city, and a bridge engineer whose designs are invariably of architectural merit, is stated to have said at a recent meeting of the Municipal Art Society that the towers of the new East River Bridge were the "ugliest possible." While we are scarcely prepared to go so far in condemnation as this, we must confess that we have always regarded these towers as unshapely. The most serious defect, from the architectural standpoint, is the very abrupt angle in the towers at the level of the roadway. The two halves of the tower are vertical to about the level of the roadway, and then incline inwardly at a decided angle, making an awkward and irregular outline which is entirely out of harmony with the curves of the main cable, or the unbroken vertical lines of the approach and the main trusses of the roadway. Mr. Lindenthal would doubtless have designed these towers with symmetrical curves, such as he adopted on his very artistic design of the Hudson River Bridge. Such towers might have been slightly more expensive to build, but the extra cost would have been a small price to pay for the added beauty which would have been given to the whole conception. This is not by any means the first time, as we have already suggested, that the East River Bridge has been criticised for its lack of æsthetic beauty. Some two or three years ago the Hon. Salem H. Wales, at that time a member of the East River Bridge Commission, gave warning that the designers of the bridge were disregarding the æsthetic elements of the problem, and urged that steps should be taken to beautify the towers. It will be a pleasure to some of our older readers to recall the fact that many years ago Mr. Wales was one of the editors and proprietors of the SCIENTIFIC AMERICAN.

RAILWAY WORKMEN AND DISBURSEMENTS.

The growth of our railroads in recent years has been so rapid that they exert an influence on the whole national life scarcely comprehended by outsiders, and politically, financially, and socially they form in the aggregate a factor of far-reaching importance. No other business, except that of agriculture, employs so many men, nor does any other single industry begin to distribute such an amount of money in wages and interest and dividends as the railroads. The combined number of employés of the railroads of the United States is roughly estimated at a million, with some five millions directly dependent upon them. This army of employés includes officials, clerks, engineers, firemen, trainmen, and mechanics and workmen in the shops, stations and general offices, representing the widest range of work. The railroads thus touch upon a dozen different technical and industrial fields, with workmen graded from the unskilled day laborers on the tracks up to the engineers and officers, with their highly technical knowledge and training.

Last year the gross earnings of the railroads of the United States amounted to $1,487,000,000. This enormous amount puts all other industrial corporations or combinations of corporations in the shade. Of this sum, $577,000,000 went to pay for labor that appeared regularly on the pay rolls. The stockholders received as their portion some $118,000,000, while the balance, or some $910,000,000, was needed for rentals, interest, taxes, supplies and material.

In view of these figures collected for 1900, it is interesting to note the disbursing power of this gigantic industry. Over a billion dollars are annually distributed throughout the whole of the country by the railroads in the form of wages, rentals, taxes, interest, and payment for supplies and raw material. A good deal of this money is paid for rolling stock and steel rails, which in turn becomes wages for employés in the mills and shops which turn out these necessary articles of railroad building. In other words, according to a recent authority on railroad matters, the gross earnings of the railroads are distributed as follows: Of every $100 earned by the corporations, $39 go directly to the employés of the road in the form of wages and salaries, $27 for supplies and the labor required to produce them, $23 for interest and rentals, $3 for general taxes, and $8 to the stockholders. The general distribution of the vast gross earnings of the roads is thus so general and over such a wide area that the railroads might well be considered the greatest combined agency for equalizing the general circulation of money in the world.

The disbursement of $577,000,000 a year among the direct and regular employés of the railroads represent a weekly pay roll of about $10,000,000. This would give to each employé, if divided equally, about $11 per week, or $570 per year, for his services. To carry this disbursement further, it will be seen that according to our population, there would be about $75 a year for every person in the country.

The distribution of the money thus collected and earned by the railroads is further shown by the payment of the $910,000,000 for material, supplies, rental, interests and taxes. These supplies include the rolling stock, steel rails, offices, buildings, and innumer-