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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.

THE QUEBEC BRIDGE DISASTER.

The collapse of the great Quebec cantilever bridge, with a loss, as at present estimated, of over eighty men, is one of the greatest disasters of the kind that have happened in the history of bridge construction. For a parallel, we must go back to the fatal disaster to the Tay bridge, Scotland, when several spans, containing a whole trainload of passengers, were blown down in a fierce gale of wind, falling into the waters of the Tay, and carrying the passengers entombed in a double cage from which there was absolutely no escape. The fall of the Quebec bridge, however, differs from that of the Tay bridge in the fact that the modern structure was merely in course of erection, and the lives lost are entirely those of the workmen. At the present writing the information available is too meager to admit of any accurate statement as to the immediate cause of the disaster. Judging from the nature of the collapse, and the fact that the portion of the bridge on which it actually commenced is now probably lying in 200 feet of water, the actual facts may never be brought to light. This is the more likely, because the lives of all of the workmen who were engaged at the outermost portion of the bridge were lost, and there will therefore be no close-at-hand eyewitnesses to state where the breaking down of the structure first commenced, and from what cause.

The great Quebec bridge, as designed, is the largest of the cantilever type in the world. It consists of two shore arms of about 500 feet in length, and a central span 1,800 feet, consisting of two cantilever arms and a suspended central span. The bridge is notable as containing the longest span of any bridge yet built or under construction, the main span being 90 feet longer than the longest spans of the Forth bridge in Scotland. The bridge is being built according to the usual methods; the shore arms being erected upon false work, and the river arms built out by overhang, the material being handled by a massive steel traveler. The northern cantilever is practically completed, and, at the time of the disaster, according to the telegraphic dispatches, the southern cantilever had been built out some 850 feet over the main channel. A whistle had just sounded for the men to cease work when the collapse commenced; and, apparently, the first breakdown occurred in the outermost panel of the work. According to the statements of eyewitnesses, the collapse of the cantilever was gradual, the whole length of it failing and falling into the river panel by panel. The structure was crowded with workmen, 92 in all having been upon the work when the disaster occurred. Of these, only a few appear to have been saved. The whole of the southern cantilever, including the shore arm, or about 1,300 feet of the structure, is in the river.

If it be true that the failure commenced at the outermost panel of the bridge, it seems to us entirely possible that the bolts, which had been placed temporarily in the rivet holes of some of the riveted connections, may not have been in sufficient number to carry the load of the new work. It is possible that the heavy traveler had been moved forward on to this work, and that, preparatory for operations the next day, some of the heavy bridge members had also been brought out to the end of the cantilever. We shall hope to give fuller details in our next issue.

PROGRESS OF THE CATSKILL WATER SUPPLY.

The letting of the contract for the construction of the great Ashokan dam, which will form the principal feature of the new water supply for this city, marks an important step in the prosecution of this great enterprise. Although the lowest bid was some $2,000,000 below that of the successful bidder, or $10,000,000 as against $12,000,000, the Commissioners decided to let the contract at the higher figure. This was done under the conviction that it would be impossible for the lowest bidder to carry through this great work for the sum named, the estimates of the Commissioners' own engineers having shown that $10,000,000 was $2,000,000 less than would be necessary to build successfully a dam of this character and magnitude. Mayor McClellan, the Commissioners, and their Chief Engineer, Mr. Waldo Smith, are to be congratulated on the vigor and dispatch which they have shown in the handling of this, New York's greatest municipal undertaking. From its very inception the job has been absolutely free from the taint of political interference. It was the Mayor's wish that the work should be so handled; the Commissioners have been of the same mind; and Mr. Smith is credited with the statement that not a single politician has approached him since the beginning of the work. This is as it should be; and if the work can be carried through to the end on this clear-cut principle, it will serve as an object lesson to the various departments of this city and to the politicians of New York, as a whole, which cannot fail to be most salutary and lasting.

At the present time there are over 700 men engaged in the engineering department, in the work of completing the surveys and locations, and carrying on the many and important borings. With the inception of the actual work of construction, this force will be very rapidly increased; for it will be the policy of the Chief Engineer, who has determined that only the very best work shall enter into the construction, to employ as inspectors young engineers of the proper technical qualifications; "men who feel that their future success depends on their records in their first work, and who cannot be forced by threats or persecution to wink at inferior methods of construction."

THE CRUISE OF OUR BATTLESHIPS TO THE PACIFIC.

Now that the acting Secretary of the Navy has confirmed the statement, made by Secretary Loeb, that a fleet of sixteen battleships will start early in the winter on a cruise to the Pacific, all doubt that this extraordinary maneuver is to be carried through is removed. The acting Secretary states that the fleet will sail from Hampton Roads on December 15, and that it will consist of sixteen battleships, six torpedo boats, four supply ships, and nine colliers, making thirty-seven ships all told. According to the present itinerary, the fleet will reach Trinidad, 1,780 knots distant, on the 23d of December; Rio Janeiro on January 10; and Magdalena Bay by March 5 of next year. Here the fleet will remain one month for target practice. If the present programme is followed, San Francisco, distant 1,000 miles from Magdalena Bay, will be reached April 10. The total distance to be covered on this route is 13,772 miles, and of the whole time consumed on the voyage, the fleet will be cruising sixty-three days, and will be in port coaling and engaged in target practice fifty-two days.

Naturally, the coaling problem is a serious one, and the speed of the fleet has been determined by the necessity for strict economy of fuel. The steaming speed will be about 10 knots an hour, which is considered to be the most economical average speed for the cruise. It is estimated that if the ships start with full coal bunkers, the fleet will require for the whole cruise an additional 100,504 tons of coal, exclusive of the coal consumed on the torpedo boats. This enormous supply will have to be carried on colliers. Four of these, carrying 2,200 tons of coal each, will accompany the fleet as far as Trinidad; and five of our larger colliers, carrying 4,000 tons each, will accompany the fleet as far as Rio Janeiro. Furthermore, it will be necessary to charter twelve additional colliers, four of which will await the fleet at Sandy Point, Magellan Straits; four at Callao, Peru; and four at Magdalena Bay. In addition to the colliers, the "Panther," which is equipped with a complete machine shop, and the supply ships "Culgoa" and "Glacier," will accompany the fleet throughout the entire voyage.

BETTER RAILS FOR 1908.

We understand that the conferences already held of the joint committee of the railways and the rail-makers on the subject of new rail specifications, give reason to expect that the conflicting interests will have no difficulty in framing specifications which will insure a much better quality of steel rail being provided for the forthcoming year. It is likely that the new rail will be of a more satisfactory section, with a better distribution of metal between the head, the web, and the base. On the important subject of what is known in the trade as "minimum discard," that is to say, the least amount that shall be cropped from the head of the ingot, it is likely that the percentage will be increased from 10 per cent to 25 per cent, and the cost of the rails advanced from $28 to $33 per ton. It is not likely that the maximum percentage of phosphorus, which now stands usually at about 0.10 per cent, will be materially reduced in the new specifications; but the manufacturers are so thoroughly alive to the necessity of reducing the phosphorus, that they are rapidly installing open-hearth furnaces, with a view to providing rails carrying the 0.06 per cent of phosphorus demanded by modern conditions.

The proposition of the rail-makers that the weight of even the heaviest 80 and 100-pound rails be increased to meet the higher speeds and heavier loads of modern traffic, is not meeting with much favor, the 100-pound rail, in particular, being considered amply stiff even for modern requirements. The 100-pound rail section was adopted fourteen years ago, at a time when the maximum load on the driving wheels of fast passenger engines was only 20,000 pounds per wheel. The maximum wheel load for passenger engines has gone up to 30,000 pounds, and at the same time there has been an increase both in the number of fast heavy express trains and in the speed of the trains themselves.

On this phase of the subject we are inclined to agree with the position taken by the rail-makers and the locomotive builders; for although the present 80 and 100-pound rail, if rolled of steel of the proper chemical composition, and if given the proper time for thorough mechanical working in the rolls, is sufficiently heavy to carry successfully the heaviest modern traffic during the summer and autumn seasons, we believe that for winter and spring service, when the road is thrown more or less out of line and level by the action of the frost, it would be advantageous if the weight of the rail were increased to 110 or 115 pounds per yard.

WHY EROSION IS GREATER IN LARGE GUNS.

It is a fact well known to artillerists that the erosion of the bore takes place more rapidly in large than in small guns. This is generally considered to be due to the fact that in the larger guns, the hot powder gases are longer in contact with the bore of the gun. The longer period of contact is due to the greater length of the gun, and the longer time that it takes the projectile to travel from the powder chamber to the muzzle. The case has been very clearly stated in a recent article by John F. Meigs, Engineer of Ordnance of the Bethlehem Steel Company, who shows that if we take a number of 50-caliber guns, of various diameters of bore, the charges of powder and the projectiles will vary as the cubes of the calibers, and the pressures in the powder chamber and at the muzzle will be equal in all guns of the same system. Thus in the case of a 3-inch, 50-caliber gun and a 12-inch 50-caliber gun, the velocities at the middle point of the bore and at the muzzle will be the same when the guns are similarly loaded. Consequently, it follows that the time occupied in the passage of a projectile down the bore of the gun will vary directly as the caliber. In the case of the 3-inch gun, the projectile must travel 12½ feet; in the case of the 12-inch gun, 50 feet; and, since the velocities at corresponding points down the bore are similar, the white-hot powder gases will be held within the gun four times as long, in the case of the 12-inch, as in the case of the 3-inch gun, and the surface of the bore will be subjected four times as long to the scoring rush of gas of equally high temperature moving at equal speed.

Now, at the 38,000 pounds pressure, which exists in the chamber of all 50-caliber guns having a muzzle velocity of 3,000 feet per second, the temperature of the gas is about 2,000 deg. Steel will melt at 2,800 deg. Fah., and the temperature of the welding heat of steel is about 2,000 deg. Steel at 800 or 900 deg. Fah. is distinctly softer and has less strength than at ordinary temperatures. Hence, it is reasonable to conclude that the accuracy-life of guns of similar proportion decreases faster, as they are fired, than in simple ratio of the increase of caliber. This is in agreement with the facts; for it is found that the accuracy-life of a 0.33-inch hand-rifle using pressures of 38,000 pounds is about 3,000 rounds; while the upper limit of the life of a 12-inch gun of similar proportion is only 83 rounds. Since it is known that the accuracy-life of a 0.33-inch 50-caliber gun at the pressure given above is 3,000 rounds, it is estimated that the number of rounds which the various calibers of guns will fire before they lose their accuracy is, for the 1-inch, 1,000 rounds; the 3-inch, 330 rounds; the 5-inch, 200 rounds; 6-inch, 166 rounds; the 8-inch, 125 rounds; the 10-inch, 100; and the 12-inch, 83 rounds. It should be understood that the above figures indicate merely the point at which the accuracy of the gun will probably become impaired. The muzzle velocity would not be altered at that point; but there would be a loss of accuracy that would increase steadily with successive rounds, and the projectile would be liable to tumble end over end in its flight.

To the above causes of the more rapid depreciation of the larger guns, should be added, we think, another disadvantage which is inseparably associated with large caliber, and that is, the increasing annular opening at the moment of discharge between the bore of the gun and the wall of the projectile, due to the elastic stretching of the gun under the powder pressure. This annular opening permits a certain amount of the gases to escape, at enormously increased velocity, past the base of the shell, and the cutting action of the gases at this higher speed is, of course, vastly in-