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NEW YORK, SATURDAY, MAY 5, 1906.

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.

COURAGE AND SYMPATHY IN DISASTER.

Apart from the physical causes, the material losses, and the technical lessons of the San Francisco tragedy, of which we treated fully in our last issue, there are other considerations which, dimly perceived while the tragedy was enacting, stand out in bold relief now that distance gives them their proper proportion and significance.

For we feel that our chronicling of this stupendous event would be incomplete if we failed to pay tribute to the indomitable spirit displayed by the San Franciscans, when earthquake drove them to the hills to watch the swift obliteration of their city by consuming fire. We may search all history in vain to find a dramatic parallel to that piteous spectacle of two hundred thousand half-naked and altogether homeless people watching, in hopeless impotence, from the encircling amphitheater of the hills, the wiping off the earth of over twenty square miles of this their picturesque and passionately-loved capital city of the West!

To the extraordinary courage and self-control of the stricken citizens, and the perfect discipline of the United States regular troops, is to be attributed the fact that this enormous horde of homeless and utterly-ruined people should have come through such a terrible ordeal, without even a suggestion of those fatal panics, or wild orgies of despair, which might well have followed in the wake of such a disaster.

This is not the time for indulgence in the commonplaces of moralizing; but again we feel that our record of this event would be incomplete without a reference to that spontaneous flood of practical generosity, which instantly rolled in upon the stricken people from every State and city of the Union. Capital and labor, railroad and factory, church and theater, all have joined hands in ministration, until some twenty millions of money and unknown millions in supplies and necessities are now pouring into the devastated city.

The homeless refugees have scattered, some never to return. The majority, however, will come back to a more beautiful city, which, in its broader streets, more stable and enduring structures, the better adjustment of its municipal improvements, and above all in the unconquerable spirit of its generous and gifted people, will retain for San Francisco its well-won title of the Queen City of the Far West.

AN OPINION FROM PANAMA.

In regard to the vexed question as to whether it is advisable to build a sea-level or lock canal at Panama, it will be admitted that if, among the engineers who are now working upon the Isthmus, there is found to be a consensus of opinion in favor of one particular type, such agreement ought to be taken as very strong presumptive evidence that this particular type of canal is the best one to build. Among the voluminous testimony which has been taken before the Senate during the past few months, there is on file a letter from Chief Engineer Stevens, dated before the publication of the conclusions of the Isthmian Canal Commission, which states that the whole engineering staff seems to be unanimously in favor of the construction of a high-level lock canal. The letter says:

"Of the engineers who are now on the Isthmus in the employ of the Commission, of all ranks, of all degrees of experience and knowledge, I have yet to find a single man who is in favor of a sea-level canal. Most of them are very outspoken against such a proposition; and while it may be said that they are not men of world-wide reputation in technical knowledge and experience, I claim that an intimate knowledge of the conditions, obtained by a residence of months and years on the ground, is of far more value than any theories or conclusions, which may be drawn from existing works in other parts of the world, which bear not the slightest resemblance to the proposition at Panama."

To the engineering mind a statement of this character, coming from a Chief Engineer resident on the ground, must have a profound significance; for we doubt if there is any other profession in which the younger members take such a keen interest in, and make such a thorough study of, the larger current problems of the day in their particular sphere of work, as in that of civil engineering. Climatic and topographical conditions exercise such a controlling influence on engineering works of magnitude, that the local experience of a well-equipped man in the field, even though he be young in years and practice, may easily outweigh, for the particular problem in question, the judgment of a ripe experience which is based largely upon other conditions in far-distant and widely-scattered lands.

TRIAL SPEED AND SEA SPEED.

Among the advantages claimed for the increasingly popular passenger ships of large size and moderate speed, should be mentioned the fact that many of them are showing in regular service a rate of speed which is fully as high as that which they maintained on their trials in smooth water. Moreover, because of their great weight and momentum and their moderate speed, they are not so greatly affected by adverse weather conditions as the faster ships, and their coming and going is marked by great regularity and a close adherence to the sailing schedule. If a 23-knot ship runs into a heavy head sea, it must make a much greater reduction in its speed than is necessary in a vessel of say 15 to 17 knots speed; and, consequently, it will be more liable to miss a tide and suffer a night's detention, say at Quarantine, New York, than a ship of the slower type. As showing how the big vessels of the intermediate type are running well up to their trial speeds, we may take the case of the "Amerika," which, in a recent passage from Cherbourg to Sandy Hook of 3,140 miles, maintained an average speed of 17.31 miles an hour; while on its preceding easterly passage, it covered a distance of 3,088 miles in seven days, six hours, and twenty-four minutes, which works out as an average speed of 17.71 miles an hour. The high-speed liner, however, is not in any danger of being forced out of the field by its slower sisters; as witness the fact that the North German Lloyd have under construction a twin ship to the 23½-knot "Kaiser Wilhelm der Grosse," and that the Cunard Company will shortly put a pair of 24½ to 25-knot vessels in service. So rapid is the increase in the number of those who can afford to pay the highest rates for Atlantic travel, and so great is the demand for rapid transit on the part of those to whom time is an object, that we look to see a limited number of 25-knot vessels built from time to time for the Atlantic service. The majority of the transatlantic liners of the future, however, will undoubtedly be of the "Amerika" and the "Baltic" type; for not only are these the ships upon which the companies depend for the greater part of their revenues, but because of their steadiness, absence of vibration, and the more lengthy sea trip which they afford, they are becoming increasingly popular with the traveling public.

A RETROGRADE STEP.

It is decidedly discouraging to learn that a special board of the United States army has been the first to acknowledge defeat in the attempt which is being made by all the gun makers of the world to produce successful, high-velocity, large-caliber guns. This acknowledgment of defeat is candidly made in a recent report of the National Coast Defense Board upon the coast defenses of the United States and the insular possessions. The rock upon which the committee's hopes of producing a successful high-velocity gun have been wrecked is that ever-present trouble of "gun erosion." From the first introduction of smokeless powders, with the fierce temperatures which accompany the high powder pressures that are necessary to secure high velocity, gun erosion has been the perpetual *bête noir* of the artillerist. Do what he would to prevent it, he has been unable, so far, to find a remedy—which is little to be wondered at, when it is stated that while he is perfectly familiar with the results of gun erosion, he is still very much in the dark as to the exact way in which it does its destructive work. About all that he can tell us regarding this trouble is that the surface of the bore is gradually pitted and eaten away, the damage being most severe in the first few feet of the bore next to the powder chamber, and decreasing in severity until the muzzle of the gun is approached, when erosion begins again to be more marked. Broadly speaking, it may be said that erosion increases with the velocity; not because velocity itself induces erosion, but because high velocity can only be secured with high powder pressures, and high powder pressures mean enormously high temperatures in the gases—these temperatures being supposed to run up to something between 8,000 and 9,000 degrees at the moment of explosion.

Many explanations have been offered of this eroding action; but it is generally believed to be due to the rush of a certain amount of the gases past the shell, and this is believed to be due to ineffective sealing, or obturation, at the base of the shell. The rush of the white-hot gas between the shell and the bore is supposed to burn away the surface of the latter in much the same way as a stream of boiling water will rapidly melt away a block of ice.

The problem may be met in three ways; first, by accepting the situation, and using the guns until they become too badly eroded for accuracy, and then returning them to the shops to be relined. This is the plan adopted by the British. Another method would be to abandon high velocities and go back to the heavier projectiles and lower powder pressures of fifteen years ago; while the third alternative would be to exhaust every effort to find some better method of obturation, by which the gases could be confined at the base of the shell.

Now of these three alternatives, we regret to observe that the Board on National Coast Defense has adopted the second, and proposes to go back to the velocities that characterized our earlier weapons of the eighties. To quote the words of the report: "In developing this energy," namely, 47,299 foot-tons, due to an initial velocity of 2,550 foot-seconds in the 12-inch coast-defense gun, "the high temperature due to smokeless powder and the great increase in the volume of gas produce an erosion which materially shortens the life of the gun. There is little to warrant the hope that any material improvement will be speedily effected in the manufacture either of steel for gun construction, or in powder to overcome this erosion. . . . For these reasons the Board recommends the adoption of 14-inch guns," of 2,150 foot-seconds velocity, because "*by increasing the caliber of the gun, an equal or greater fire effect can be secured by employing a diminished velocity*," as compared with the high-velocity 12-inch gun above mentioned.

We have placed in italics the clause of the above sentence to which we feel compelled to take strong exception, for it is contrary to the theories and the decided trend of modern gun construction. The energy imparted to a projectile varies directly as its weight and as the square of its velocity. A lowering of the velocity of a projectile calls for a relatively much larger increase in its weight if the same energy is to be obtained. But the increase of the weight means an enormous increase in the weight and cost of the gun and its mount and emplacement. This is shown in the figures given in this report for the relative cost of the 12-inch high-velocity gun and of the low-velocity 14-inch gun which is proposed as a substitute. The respective costs of the 12-inch gun, its carriage, and its emplacement are $43,465, $45,000, and $100,000; for the 14-inch gun, the respective costs are $60,000, $72,000, and $150,000. One 12-inch gun, therefore, will cost $188,465, and one 14-inch gun $282,000, an excess for each low-velocity piece of $93,535. As it is proposed to emplace nineteen of these pieces, the country is called upon to expend a total of over $1,750,000 in the construction of batteries which, look at it any way we will, will mark a retrograde step in the art of gun manufacture.

Furthermore, these 14-inch guns will be distinctly inferior to the high-velocity 12-inch in accuracy; for the trajectory, or curve of flight of the projectile, will be steeper, and the danger space considerably less, particularly at the more distant ranges. A given amount of error in the estimate of distance and elevation of the gun, which would mean a miss for the 14-inch, would still involve, because of its flatter trajectory, a hit for the 12-inch piece.

It is surely a little early yet for the army to throw up the sponge in this all-important problem of gun erosion. We have long believed that it can be solved by some method of sealing the base of the shell; and we submit to the Secretary of War that if ten per cent of the $1,750,000 which it is proposed to spend were set aside for an exhaustive experimental investigation of this problem, a way would be found to obviate gun erosion, and prevent this wholesale and all-too-early capitulation.

That the radio-activity of air may be due to the escape of emanations from subterranean regions, to heat in the earth's interior causing the expulsion of negative ions from certain oxides, or to ions received from the sun, is suggested by H. Nagaoka, in a paper on radio-activity and geophysical phenomena, published in the Physico-Mathematical Soc. Tokyo Proc. The examination of the smoke from the volcanoes is proposed as a source of information which will enable us to decide the question. The possibility of terrestrial magnetism being due to the rotation of the earth, the outer crust of which is electrified by the presence of ions escaping from the interior, is pointed out. Supposing that electro-magnetic mass could be detected by a balance, it follows that those atoms whose electrons are moving the most rapidly will be the heavier, and the ratio of the atomic weights will not be the ratio of the number of electrons. Deviations from Prout's law could thus be expected.