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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.

PUSHING A GOOD PRINCIPLE TOO FAR.

The opposition to the construction of an elevated loop through the east side to connect the Williamsburg and Brooklyn bridges is a clear case of pushing a principle, good in itself, to harmful extremes. The widespread objection to the construction of any more elevated railroads on Manhattan Island is a sound one, being based upon considerations of the health and comfort of the people and the architectural and æsthetic appearance of New York city, both of which would be further menaced by the erection of additional structures of this kind.

The proposal to build the Delancey Street elevated loop, however, contains an explicit proviso that the structure is to be considered as a purely temporary expedient for relieving the traffic congestion at the termini of the two bridges, and that as soon as a subway loop can be constructed to take its place, the elevated structure is to be removed.

It is not denied that the construction of the loop would be a disfigurement for the time being of the streets through which it would pass, or that it would be something of an obstacle to street traffic, or that it would seriously shut out light and air from the buildings. Against these drawbacks, however, is to be set off the enormous advantage that would immediately ensue to the many millions who travel between Brooklyn and Manhattan. Traffic movements would be expedited, the present congestion largely broken up, and the well-recognized evils that arise from the fact that the Manhattan end of the Brooklyn bridge, and to a less extent of the Williamsburg bridge, is a terminus, would be entirely removed.

FUEL AND WATER CONSUMPTION ON THE "LUSITANIA."

Since the launch of the "Lusitania" the British technical press has devoted an unusual amount of attention to this remarkable ship. One of our contemporaries, basing its calculations on the contract indicated horse-power of 65,000, estimates that this will mean a consumption of not less than 435 tons of steam per hour, and a corresponding consumption of 50 tons of coal in the same time. This would work out at a total of 1,200 tons per day. On the ground that for the economical working of the turbine it is necessary that the vacuum should be very high, it is estimated that about fifty times as much water must be passed through the condensers as the steam that is delivered to them, or say, 22,000 tons of water per hour, or 528,000 tons per day. For the combustion of the coal 700 tons of air must pass through the furnaces every hour, or 21,000,000 cubic feet.

These calculations of our contemporary Engineering are based upon what is probably a closely correct estimate of the coal consumption. The writer had the good fortune to spend many hours in the engine room of the "Deutschland" on the occasion of one of her record-breaking trips when she showed an average indication of over 37,000 horse-power and an average daily consumption of 672 tons of coal. This, it will be observed, is a smaller ratio of total coal consumption to total horse-power than is estimated for the "Lusitania"; but as the "Deutschland" burned only 1.3 pounds of coal per horse-power per hour for the main engines, and the marine steam turbine, at least in its larger sizes, makes greater demands on coal, we think the estimate of 1,200 tons of coal per day for the "Lusitania" will prove to be very near the mark. For a five-day trip this would call for a bunker capacity of not less than 7,000 tons—for some margin must be left for contingencies of breakdown, in which the time of passage might be greatly extended.

CANALS AS RATE REGULATORS.

In the field of transportation there is a decided revival of interest and activity in interior canal construction. Before the advent of the railroad the canal formed the most serviceable means for the transport of freight between important centers of industry. It had the advantage over the freighting wagon of being able to carry material in considerable bulk and at lower cost; moreover, under average conditions, it was a more rapid method of transportation. Although the canal interests maintained an active competition with the early railroads, the all-important question of time decided the question in favor of the latter and canal traffic declined, many of the lines falling into disrepair and finally into disuse.

The decadence of the inland waterway has been more complete in some countries than others, for in France and Germany there came, in course of time, a revival of activity and a new era of construction which has brought canal traffic up to the position of importance, both as a regulator of rates and an important auxiliary to the railroads, which it should properly fill. The canal system of Great Britain, on the other hand, has declined until it consists of a few inadequate and little-related lines, which are too ill-equipped and too insignificant to exert any serious influence upon the freight traffic at large.

At the present time a royal commission is engaged in an inquiry into the canal system of the country; but such commissions move slowly, and the necessity for individual action has led the individual interests of the great manufacturing counties of middle and northern England to take action at a conference held at the invitation of the Birmingham Chamber of Commerce. The points under consideration were, first, that in order to provide healthy competition with the railroads, it was desirable that a complete system of through communication by water should be provided between centers of commercial, industrial, or agricultural importance and between such centers and the sea; that in view of its national importance, such a system should be acquired and controlled by the government, or by a public trust in which the government should have the controlling vote; and that in either case the sinking fund and interest on capital expenditure should be guaranteed by the government. The scheme should prove sufficiently attractive to private capital to render any appeal to the government unnecessary; indeed, it is questionable whether to the heavy burden which it already carries, the national budget could add this additional heavy obligation.

Here in the United States, our canal system was never developed to the extent that obtained in Europe. The development of the country to its present proportions has taken place side by side with that of its railroad system; indeed, it may truly be said that our stupendous development in agriculture, commerce, and industry, has been made possible by the railroad. With the cheaper and more quickly constructed railroad available there was no inducement to undertake the construction of costly canals; and if we except the notable Erie Canal, and a few others of less importance, the railroads have been practically free from canal competition. The enlargement of the Erie Canal, which is now being actively prosecuted, is destined to raise that waterway to something of the importance that it possessed in its most flourishing days; and it is reasonable to expect that its success in regulating rates and redirecting traffic into the natural channels from which it has been turned by arbitrary discrimination, will prove a powerful stimulus to the extension of canal systems between the principal manufacturing and industrial centers of the country. Foremost among these will probably be the waterways connecting the Pittsburg district with the Great Lakes and the Great Lakes with the Gulf.

WITH THE BALTIC FLEET AT TSUSHIMA.

Accurate detailed information by eyewitnesses who are technically qualified to speak concerning the behavior of war material in great engagements is never available to the public until many months after the event. The Russo-Japanese war, and particularly the naval side of it, has been no exception; and it is only recently that independent outside observers have been making public the result of their experience and observation.

By far the best account of this kind that has come to our notice was published in the last issue of the Proceedings of the United States Naval Institute, by Lieut. R. D. White, of the United States navy. In an introductory note the lieutenant states that the account is compiled from information obtained from one who was present on one of the ships of the Russian fleet at the battle. As this observer had no station in battle, he was selected to observe and record the various events as they occurred, a duty which "he performed with admirable care and accuracy." Although for obvious reasons the writer does not give his name, he states that "his willingness to speak on the subject with honesty and without prejudice, his keen appreciation of the military strength and weakness of ships built and building, his power of observation in general and in detail" and his mastery of the principles of modern naval construction and warfare, lend to his statements the greatest value in the strong light they throw upon the theory and practice of modern naval design and construction. We cannot do more than briefly review this article in the Scientific American, but the full text with its illustrations will be found in the current issue of the Supplement.

The morning of May 27, 1905, is described as dawning raw and cheerless on the Baltic fleet as it steered for Tsushima Straits. The Russian sailors are spoken of as a hopeless band of men, huddled around the fire-room hatches or seeking shelter in some favoring lee about the deck, while a spirit of pessimism seemed to pervade the whole fleet. As day was breaking, a Japanese cruiser loomed through the fog, and the clicking of the wireless instruments on the Russian ships intimated that a message was being sent to Togo giving the position of the Russian fleet. Strange to say, no attempt was made to intercept or break up this message. Soon afterward the Russians sighted one of the Japanese armored cruisers, which for two hours kept abreast of the Russian battleships on the starboard side at a distance of about 8,000 yards. The fleet entered the battle at a speed of 9 knots and this was its standard speed throughout the engagement. When the Japanese fleet was sighted, it consisted of twelve ships in line ahead standing almost directly across the Russian course. The observer on the Russian ships speaks of their formation as being faultless and their speed sixteen knots an hour, a disparity in speed which seems almost incredible and must, of course, account largely for the baffling and overwhelming tactics displayed by the Japanese throughout the battle.

Without following the course of the conflict as seen from the Russian ship, we draw attention to some of the salient features. As the Japanese column cleared the path of the Russians, they turned and steamed parallel in a directly opposite course to that of the enemy and "then, judging his time with beautiful exactness, Admiral Togo countermarched and brought his entire fleet into action, opening fire at six thousand yards' range. As each ship made the turn, she opened fire on the battleship "Oslyabia" with results that were fearfully destructive. The forward turret was put out of action when she had fired only three shots. A shell striking the embrasure beneath one gun jammed the gun in its full elevation and by the force of its explosion lifted the top of the forward turret. The water line of the "Oslyabia" from the forward turret to the bow was unarmored. Five high-explosive shells each made an enormous hole in the bow plating, and the water, entering, brought the ship down until her three-inch battery gun ports were awash. Three twelve-inch shells striking in succession an armor plate on the water line amidships, first loosened, then tore it off, and finally opened a huge hole in the side of the ship. In one hour after the opening of the engagement the "Oslyabia" turned over and sank.

Early in the action a shell entered the embrasure in the forward turret of the "Suvaroff" and, exploding, ignited several bags of powder, with the result that the roof of the turret was blown off and landed on deck, leaning against the turret. These two embrasure accidents emphasize the necessity for using port shields to guard this vulnerable spot; and we are glad to note that in our later ships an excellent design of very heavy port shields has been fitted to the guns of the main battery. As further showing the terrific destruction of modern high-explosive shell, it is recorded that all the forward shell plating of the battleship "Suvaroff" above the armor belt was shot away nearly as far aft as the turret, causing the vessel to resemble a monitor, and at 2:25 P. M. (the firing opened at 1:55 P. M.) she left the line, ablaze fore and aft and unable to withstand longer the terrific bombardment. With the "Oslyabia" and "Suvaroff" gone, the "Alexander III.," sister to the "Suvaroff," received the concentrated fire of the Japanese fleet at a range of from 5,100 to 5,600 yards, and she was forced to turn to the eastward in the effort to escape it.

A remarkable and very disconcerting fact noted by the observer was the number of fires that broke out on board the new Russian battleships, and this in spite of the fact that woodwork had been eliminated as far as possible, in accordance with modern theories. On one of the new ships, the "Orel," thirty-four different fires broke out during the day. Several fires occurring in the hammocks stowed just forward of the bridge, drove the occupants from the conning tower. Hawsers proved to be exceedingly troublesome, catching fire easily, producing much pungent smoke, and being difficult to extinguish. One of these, burning abaft of the bridge, again drove all hands from the conning tower. The smoke also was drawn by the blowers into the forward fire room, and this compartment had to be abandoned. This last contingency is one surely that no naval architect had ever contemplated. The smoke also filled the port forward six-inch turret with smoke, which penetrated to the lower decks, causing consternation there. Another curious fact developed in the fight was that there was great danger of fire in the war-paint on the side plating of the ships; for when the "Alexander III." fell out the war-paint over the whole of her side facing the enemy was ablaze.

In turn the "Borodino" and then the "Orel" were selected as the principal target. In six minutes the former was struck twelve times with 12-inch, and thirty to forty times with 6-inch and 8-inch shells. The eyewitness of this tremendous drama has this to say of high-explosive shells: "To realize the terrific effect of this shelling, one must consider that a shell filled with Shimose powder is really a small torpedo; that each 12-inch shell striking an unarmored portion made a hole 7 feet high and 6 feet wide; that the fragments of these shells were minute particles that filled the air like driving mist; and that a dense black smoke settled down after each explosion, blinding and suffocating all in the vicinity. One sailor is known to have been struck 130 times by fragments from a single shell."

The great lesson of the conflict, as deduced by this spectator, is that gunnery and tactics must ever be the determining factors in naval battles between equal forces. In the sortie of August 10, the Japanese made poor shooting. Between that date and the battle of Tsushima, no effort was spared to perfect their marksmanship. It is estimated that, between them, the 12-inch guns fired 1,275 shots, and of these 19.6 per cent were hits. The average range was 5,000 yards and the condition of the atmosphere hazy. Lieut. White remarks very aptly that this record is enough to make all who think, think hard. On the other hand, the Japanese had little to contend with in the way of interference by the fire of the Russians, the "Mikasa" being hit only a few times throughout the battle.

Although telescopic sights were used on the guns by the Russians, they were greatly interfered with by mist and spray and in some cases rendered quite useless. Coal had been stowed everywhere on the ships, and the shock of the shells and firing stirred up coal dust from corners and crevices, making it impossible to see either with or without the telescopes; moreover, shells falling short and striking the sea, deluged the ship with salt water and blurred the telescopes, leaving them salt-incrusted.

POISONOUS EGGS.

All substances are poisonous when they are injected in a certain quantity into the circulatory system of an animal. The weight of the substance injected as compared with that per pound of the animal forms what is called its toxicological value. Numerous experiments have been made with a large number of substances, especially by Prof. Bouchard, according to Cosmos, who has studied the toxicological value of the physiological media; but up to recent times no one had investigated the toxic value of eggs. This has now been done, however, by M. Loisel, who has experimented upon the eggs of the common hen, the duck, and the turtle.

M. Loisel's mode of operation is as follows: He takes the powdered yolk of a duck's egg, for example, treats it with a 20 per cent solution of salt, and injects into the veins of a rabbit until the animal dies. In order to kill a rabbit, it takes about 55 grains of the substance per pound of animal, say 180 grains for a rabbit of an average weight of 2¼ pounds. If an experiment be made with the same substance by injecting it into the general cavity, the toxicological value diminishes and the quantity required is from 375 to 450 grains.

The yolk of the hen's egg is less poisonous, and that of the turtle more so than that of the duck. The albumen of the egg also is poisonous, the toxicity increasing from the hen to the turtle. If we desire to know the cause of the toxicity, we must seek it in the chemical composition of eggs. These are composed of the yolk and the white. The white represents typical albumen soluble in distilled water, and coagulable by heat. The yolk contains a special substance, ovovitelline, which is insoluble in water, soluble in dilute saline solutions, and associated with organic phosphorated compounds, called lecithines, and cyanic ferruginous compounds called hematogens, at the expense of which is formed the hemoglobine of the blood of the young chicken.

It is to nervine, a substance allied to the lecithines, and the toxic power of which is very great and which exists in extremely small quantity in the yolk, that is due the toxicity of eggs, as also to toxalbumens (bodies as yet little known), which are highly poisonous. According to M. Loisel, all the toxic substances of eggs act upon the central nervous system.

What is of consequence for us is not the toxicological value of eggs from an experimental viewpoint, but the toxic value of eggs ingested by the natural tracts, the cause of the putrefaction of eggs, and the physiological phenomena to which putrified eggs can give rise.

Eggs, even when very fresh, give rise to severe cases of poisoning, although this depends on individual susceptibility, and according to M. Linosier, is more apt to occur in dyspeptics. The quantity ingested may be exceedingly minute, and the toxic symptoms may exhibit themselves even in a young child. Mention is made of a fourteen-months-old child, who, in consequence of the absorption of an egg, had a nettle-rash eruption, and, two weeks afterward, a second eruption caused by a cream that had been given to it.

Such phenomena generally exhibit themselves by the appearance of urticaria. The substance that produces this, and is called ovotoxine, is analogous to those that cause similar effects and are met with in strawberries, mussels, and sea fish, which give rise to accidents known by the name of botulism. We know that some individuals are very sensitive to the action of these substances.

There is here also a receptivity of the individual, and, as a consequence of these phenomena, eggs cannot be employed in cases in which there is a lesion of the digestive apparatus at some points of its passage, especially in typhoid fever, in which the intestine offers a wide surface of denudation into which the various toxines of the eggs might infilter. In all such complaints, we should prefer milk sterilized and boiled, and as free as possible from all toxines and microbes.

Along with the ingestion of normal eggs we may mention that of poisonous ones, of which neither the taste nor odor gives any hint as to their toxicity. This phenomenon is due principally to microbes that have entered the egg at the time of its formation, that is to say, into the very ovary of the duck and hen.

A remark apart must be made in regard to the toxicity of the eggs of the duck. This fowl as a general thing lives amid somewhat dirty environments, and it is possible for a considerable quantity of organic matter in decomposition to enter their organs and infect them. The egg in forming becomes contaminated with these substances rich in microbes, and thereby becomes toxic.

It is to eggs thus contaminated that may be attributed those toxic phenomena sometimes exhibited by creams. These latter, in fact, are not submitted to a very high temperature during their manufacture, while a temperature of at least 60 deg. C. would be required to destroy the pathogenic microbes of the egg. This is not compatible with culinary processes. From this point of view, since non-fecundated eggs are less toxic than fecundated ones, it is important to reject the latter as food for children and invalids. Finally, a third way in which eggs may become toxic after they are laid is by the penetration of microbes through the porous shell. These microbes have been studied by Zordenkofer, who divides them into two groups. The first group, which gives rise to a putrefaction which results in the production of sulphureted hydrogen, is the most common alteration. Ten species of this group have been described under the name of *Bacillus oogenes hydrosulfurens.*

The second group gives rise to a slightly different putrefaction the odor of which recalls that of human excrement. This putrefaction, which is much more rare, is produced by a bacterium called *Bacillus oogenes fluorescens.* All these organisms need air for their development. It is therefore necessary to keep eggs from contact therewith by varnishing the shell or coating it with vaseline or milk of lime.

The use of decayed eggs is extremely dangerous. Dr. Cameron has called attention to a case of poisoning that happened in a convent at Limerick, Ireland, in 1895, after a meal at which had been served a cream in which a bad egg had been used. Seventy-four women who partook of the meal were poisoned, and four of them died.

An endeavor has been made in this article to recapitulate the causes of the poisoning of eggs and the damages to the system that may be caused by eating them. But it must be said that poisoning by eggs is of relatively rare occurrence, and that that produced by spoiled ones is exceptional.

WHAT THE GLIDDEN TOUR PROVED.

At the termination of the third annual tour of the American Automobile Association at Bretton Woods, N. H., on the 28th ultimo, thirteen out of forty-eight contestants for the Glidden trophy still had perfect scores. The one car that was penalized two points on this day lost these points on account of an unnecessary stop, and solely through the carelessness of its occupants. Besides these thirteen perfect-score cars, one car had one, and two had two points each, while three had three and one five points against them. Seven cars had from six to fifteen points charged against them. Besides these, two contestants for the Deming trophy made perfect scores. Thus, in all, fifteen cars made perfect scores; fourteen had penalizations ranging from one to fifteen points.

No one who has not been over the route that was traversed, or at least some of the worst portions of it, at high speed in an ordinary touring car can realize what a wonderful performance was made by these twenty-nine cars. The shocks and strains they encountered were undoubtedly more severe than are those received by racing cars traveling at extremely high speed on good roads. None but the best springs and axles can stand such jolts and bumps as the touring cars received in endeavoring to adhere to the schedule. This, it is true, was lowered, after the first few days of the tour, from an average speed of 18 miles an hour to one of 15; but on such flinty, sandy, and rough roads as were met with, it was difficult to make up time lost from punctures or other troubles, even with this low average speed. The plan adopted by most of the contestants was to run as fast as they could up to each checker, spend the fifteen or twenty minutes they had gained in making repairs, pass the checkers on time, and start full tilt for the next control. If several punctures or blowouts were had in a single control, they were almost sure to lose points. One 30-horse-power touring car, for instance, after having its third puncture in one control, made a run of 10 miles in 19 minutes, running on a flat front tire of the mechanically-fastened type. The inner tube was melted, and the rim was so hot as to burn the hands of the men when they attempted to remove the tire. During some stages of the run, new axles and springs were put on several of the cars, and the time thus lost was successfully made up. As an endurance test and obstacle race, the tour was unsurpassed.

Among the forty-one contestants for the Glidden and Deming trophies that finished the tour, no less than twenty-five different makes of cars are represented. Of the four foreign cars that started, but one, Mr. S. B. Stevens's 50-horse-power Darracq, finished. Nearly all of the cars were four-cylinder machines of from 24 to 50 horse-power. The only exceptions were double-opposed-cylinder Reo and Maxwell cars of 16-horse-power, the small Maxwell speedster of 12 horse-power (used as an advance confetti car), and a single-cylinder Oldsmobile runabout of 8 horse-power, used as a repair car. A half dozen White steam machines of 18 horse-power also competed. On the last day's run Mr. Walter White's machine was ditched, in order to avoid running into a wagon. The gasoline tank was punctured on a rock, and the car caught fire, and was completely demolished. The five air-cooled cars in the tour proved their worth, two of them, the 40-horse-power Knox (which carried five to seven people) and the 30-horse-power Marmon, winning perfect scores. In this connection a word of praise should be given the 16-horse-power double-opposed-cylinder Knox baggage wagon. This was the only commercial vehicle in the tour, and it successfully transported 3,000 pounds of baggage throughout the event.

Above all else, the tour has demonstrated that American machines will stand fast driving on rough forest roads without serious damage to the cars or their mechanism. Engine and gear troubles have practically disappeared, and the only things that are to be feared are the breakage of springs and axles and the giving out of the tires. Numerous shock-absorbers were tried out and found wanting in this test; and were it not for the pneumatic tires, which have been greatly improved during the past two years, such a tour would be impossible of accomplishment.

Immediately after his car had been released, Ernest Keeler, who drove a 30-horse-power Oldsmobile touring car, left Bretton Woods for a record run to New York city. The start was made at 12:10 on Sunday the 29th ultimo, and the car arrived at Herald Square on Monday at 2:28 P. M. The elapsed time was thus 26 hours and 18 minutes. The actual running time, however, was but 21½ hours, and the average speed was 24 miles an hour. During the night run from Concord, N. H., to Springfield, Mass., an average of 30 miles per hour was made. The car covered 16 5-6 miles per gallon of fuel (the consumption being 30 gallons), while three-quarters of a gallon of oil is said to have been used. No water was put in the radiator during the run, although the motor was running with the car stationary for over five hours. The motor was not stopped from 12:10 P. M. on the 29th until 2:45 P. M. the following day, thus making 26 hours and 35 minutes of continuous operation—certainly a good demonstration of motor reliability. Probably the motors of many of the other contesting cars would have been capable of a like performance, so reliable in operation have the motors of most gasoline automobiles now become.

THE COLOR OF WATER.

It was long ago discovered that the natural color of pure water is blue, and not white, as most of us usually supposed. Opinions have not agreed on the cause of the green and yellow tints; these, it has been discovered by W. Spring, are due to extraneous substances. Dissolved calcium salts, though apparently giving a green tint, due to a fine invisible suspension, have no effect on the color of the water when adequate precautions are taken. The brown or yellow color due to iron salts is not seen when calcium is present. The green tint is often due to a condition of equilibrium between the color-effect of the iron salts and the precipitating action of the calcium salts.

Orders for 562,000 tons of steel rails have been booked ahead by American railways for 1907. These figures include the contracts placed by the Northern Pacific, Great Northern, Chicago, Milwaukee, and St. Paul, Chicago, Burlington, and Quincy, Illinois Central, and the Wisconsin Central railroads.