SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York

FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year, for the United States or Mexico.....................$3.00
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One copy, one year, to any foreign country, postage prepaid, £0 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS

Scientific American (Established 1845)..............................$3.00 a year
Scientific American Supplement (Established 1876).................. 5.00 "
American Homes and Gardens.. 3.00 "
Scientific American Export Edition (Established 1878)............... 3.00 "

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JULY 20, 1907.

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.

AROUND THE WORLD IN FORTY DAYS.

The prophetic and lively imagination of the late Jules Verne recorded one of its most daring flights, when he wrote that entertaining work, "Around the World in Eighty Days"; and it is probable that none of us who read its chapters supposed that he would live to see the day when the Frenchman's estimate of eighty days would be cut in half by an enterprising officer of the British army, who set out to test the speed of modern around-the-earth travel for himself. In a recent letter to the London Times Lieut.-Col. Burnley Campbell wrote that he landed at Dover on the 13th of June at the completion of a trip around the world which occupied forty days and nineteen and one-half hours. He left Liverpool on May 3 at 7:20 P. M., reached Quebec at 3 P. M. May 10, and was at Vancouver on the Pacific coast at 5 A. M. on May 16. Leaving there about noon of the same day, he reached Yokohama on May 26, Tsuruga on May 28, and leaving there by steamer at 6 P. M., he reached Vladivostock May 30. Here, after a wait of about four hours, he took a Trans-Siberian train, reaching Harbin on May 31, Irkutsk on June 4, Moscow on June 10, and Berlin on June 12. On the following day he was at Ostend, which he reached at 7:30 A. M., and at 2:50 P. M. of the same day he landed in England at Dover. Throughout the whole trip Lieut.-Col. Campbell was remarkably fortunate in making connections; otherwise his time would have been several days longer.

STEADY IMPROVEMENT IN NAVAL GUNNERY.

In the last analysis of the efficiency of a navy, it must be acknowledged that there is no test so reliable as that of the results in routine target practice. In estimating the offensive qualities of two warships it is futile to compare merely the number and caliber of the guns carried by each, since the comparative results arrived at may be completely upset by the extraordinarily good gunnery on one ship, or the bad shooting of the man behind the gun on the other.

The ships of the United States navy are distinguished to-day, as they have always been, by the large number and heavy caliber of the guns which they carry. In the famous duels of our naval history, the commanders of our ships have been quick to take advantage of this fact, and have aimed to disable the enemy by a quick concentration of well-aimed fire from a large number of guns. Thanks to the fact that our naval constructors have lived up to the traditions of the past, we have in commission to-day ships, like those of the "Connecticut" and "Georgia" class, which carry an armament more numerous and powerful than that of any ships of the date at which they were designed. If the marksmanship of our gunners can be brought up to the high standard of the batteries which they serve, that is, if they can acquire the coolness, speed, and accuracy which are necessary to do justice to the modern rapid-firing gun, big or little, then our navy may proudly claim that when its ships draw up in line of battle, they will stand more than an even chance to crush the enemy, as of old.

In common with the leading navies of the world, and particularly of Great Britain and Germany, the United States navy has been giving special attention, during the past decade, to the question of gunnery. Vast sums of money are appropriated yearly for target practice, which is so carried out as to closely reproduce the conditions of actual warfare. Competition is encouraged, and a spirit of keen emulation has been promoted among both officers and men. There has been developed a strong rivalry not only between the individual ships of the various fleets, but among the fleets themselves. The inevitable result has been that the marksmanship of our gunners has steadily risen in accuracy. It is gratifying to learn from a recent general order promulgated by Secretary Metcalf of the Navy, that excellent progress continues to be made. The Atlantic fleet, which is the winner this year, scored 59.34 per cent of hits against 59.24 per cent for the Pacific fleet. The "Illinois" won the battleship trophy with a score of 75.79 per cent. The "Boston" won the cruiser trophy with 79.99 per cent; the "Princeton" the gunboat trophy with 73.40 per cent; and the "Preble" won the destroyer trophy with the score of 78.82 per cent. Not only are these percentages high for the individual ships, but the average final merit of all ships has a high ratio as compared with that of the winning ship. Moreover, this ratio is considerably higher in 1907 than it was in 1906. Last year the average final merit of all ships was 64 per cent of the highest final merit; and this year it has risen to 71 per cent, which marks a most gratifying increase in the general excellence of the shooting.

RELATIVE RISK OF OVERHEAD AND THIRD-RAIL CONDUCTORS.

It will be within the memory of our readers that when the New York, New Haven, and Hartford Company announced that it would make use of the single-phase system for the electrification of its lines from Stamford to New York, a spirited controversy was provoked between the New York Central and New Haven companies, or rather between the two electrical companies which have in hand the respective electrical equipment of the two roads. Mr. Sprague, representing the direct-current, third-rail system, considered that, as the direct system was to be used at the Grand Central terminal and yards, and over the stretch of twelve miles of track to Woodlawn, and as the New Haven Company would have to use these lines and this terminal, they should have made use of the same electrical system, instead of complicating the problem by installing the alternating-current single-phase. To this Mr. Westinghouse, representing the New Haven equipment, replied that the single-phase system was chosen purely on its merits, and because, both on theoretical and practical grounds, it commended itself to the company as being the best suited to the conditions of their service.

Although the New York Central Company have had their electric zone in operation for a period of six months, the New Haven equipment still hangs fire, despite the fact that a large number of electric locomotives are on the ground, and the overhead trolley equipment has been practically finished for several months. Such trains as have been run over the New Haven system have been of a purely experimental character, carrying no passengers; and it must be confessed that the considerable number of accidents, fatal and otherwise, which have already occurred with these experimental and work trains, is far from reassuring as to the safety of an overhead catenary system carrying 11,000 volts in the trolley wire. Several accidents occurred to the erection gang during the stringing of the wires; but this is not so serious as the fact that there have been two or three cases of fatal accident to the brakemen engaged in the operation of freight trains. It is only just to the company to state that, as far as the safety of the passengers is concerned, and the protection of the public who live along the route of the line, every precaution has been taken to prevent contact with the wires. But there is no denying that the overhead lines constitute a permanent and fearful peril to the brakemen of freight trains. Ordinarily, the lines are carried at a height of 22 feet above the top of the rails, and this gives ample clearance, even when a brakeman is standing erect on a box car. But where the lines have to be carried below overhead bridges, the trolley wires have to be brought down very much nearer to the top of the cars—probably, in some cases, within two or three feet of them. And it is here that the danger occurs; for it can easily be understood that the least contact with a wire charged with 11,000 volts may mean instant death.

It is urged, furthermore, against the high-voltage system that, in case of a heavy train leaving the tracks and colliding with two or more of the lattice-work bridges which carry the overhead lines, it would be possible for 1,000 feet or more of the highly-charged wires to be brought down upon the tracks; and, although the system is equipped with automatic cut-outs designed to meet such a contingency, the idea of 11,000-volt conductors tangled in the wreck of a derailed train can scarcely be contemplated with equanimity.

On the other hand, it must be admitted that the third-rail equipment, as built on the New York Central lines, has proved to be ideal, both from the standpoint of convenience and safety. The conductor rails are underhung from insulated brackets, and the top and sides are so completely covered by wood sheathing, that accidental short-circuiting by trackmen or trespassers could only take place by actual intention. Furthermore, in cases of derailment, as was proved at the Woodlawn wreck early in the year, the third rail will probably be quickly carried away and the current cut out by the train itself. However, a comparative test of the direct-current, third-rail, and the single-phase, overhead system will soon be possible, as the New Haven Company announce that in a few days they will have their electric zone in operation. The present indications are that for terminal and suburban work the third rail has distinct advantages. For long-distance service it is probable that the alternating-current, either single or three-phase, will be universally adopted.

THE LUMIERE SINGLE-PLATE PROCESS OF COLOR PHOTOGRAPHY.

A new process for photography in colors has been brought out at Paris by Messrs. Auguste and Louis Lumière, who are among the leading *savants* of France in this department of science. They are able to take a photograph in colors upon a single plate and in an ordinary camera, with exposures of one second or less. This is done by the use of a specially prepared plate. The plate is formed by placing microscopic colored particles upon a glass plate and covering these with a layer of gelatino-bromide emulsions. Three colors are used for the particles, and they form the color screens for the plate. The microscopic elements which form the light screens are made up of a transparent matter which can be divided into corpuscles of very small size and absorb coloring matter very well. It is found that potato starch is the best adapted for the purpose. The grains are sifted so as not to exceed 0.010 to 0.012 millimeter (0.0004 to 0.0005 inch) and are divided into three portions, colored respectively orange, green, and violet. After drying, they are intimately mixed and then dusted upon a glass plate covered with an adhesive coating. In 1904 Messrs. Lumière were able to place three thousand grains per square millimeter (about 2 million per square inch) avoiding all superposition. But spaces were left between the grains, which had to be filled up to prevent white light from passing. For this purpose an impalpable carbon powder was used, and under the microscope the plate showed colored disks upon a black ground. Since then the inventors have improved the process considerably. By means of the proper machinery they are able to deposit no less than 9,000 grains per square millimeter (5.5 million per square inch) and owing to a rolling of the plate at very high pressure, the grains are crushed and flattened so as to form a colored mosaic without any empty spaces. The use of carbon powder is retained, but this appears only as a fine line. By this means we have a considerable reduction of the grain of the image so as to have a projection of some size without making the colored elements visible, and second, an increase in transmission and a reduction of the time of exposure of the plate.

Thus prepared and viewed by transmitted light, the plate does not show any coloration, as the microscopic elements having the colors orange, green, and violet combine so as to give white light. It now remains to sensitize the plate. The layer of colored grains is first covered with a waterproof varnish which has an index of refraction about the same as that of the starch grains. Then comes a layer of gelatino-bromide emulsion which is rendered perfectly panchromatic and is sensitive to all the colors.

The method of operating in the camera is as follows: An ordinary camera is used, and the lens has a color screen of special form such as is needed for the color-plate. The plate is placed in the plate-holder in the dark, with the back of the plate upward, so that the light passes through the granular layer before reaching the gelatine. Using a very luminous lens which can be worked at *f* 3, for instance, the exposure can be lowered to 1/7 second in sunlight, and at *f* 8 good results can be obtained with one second exposure. To illustrate, we may take as a colored object the American flag with the three colors, red, white, and blue. The blue rays will be absorbed by the orange particles, leaving the greens and violets to act on the emulsion. Upon developing, the silver bromide will be blackened under the green and violet particles and the plate will be transparent under the orange particles. In the white part of the flag the light will not be absorbed and will give an effect on the plate under all the colored particles. When developed, we have the surface entirely black. As to the red rays, they will be absorbed by the green particles but will pass by the violet and orange, and the latter portions will appear black. Such a plate when developed and fixed as usual will give the complementary colors of the original, and the flag will appear in orange, black, and green. Theoretically, a second prepared plate applied to this negative should give upon development a positive image which shows the natural colors of the subject. In practice the re-