"THE PROGRESS OF INVENTION IN THE NINETEENTH CENTURY."

Most of the readers of the SCIENTIFIC AMERICAN are aware to what extent it has devoted itself, for more than half a century, to the chronicling of inventions and discoveries; and the publishers have thought it desirable to bring out a volume to commemorate the completion of the nineteenth century, especially as for more than fifty years this publication has given its readers, from week to week, the latest news of great scientific and engineering achievements. The new volume, which worthily celebrates the close of the century, as far as the arts and sciences are concerned, has been entitled "The Progress of Invention in the Nineteenth Century," and its author is Mr. Edward W. Byrn, A.M., who will be remembered as the successful competitor in the prize essay competition held on the fiftieth anniversary of the SCIENTIFIC AMERICAN. Mr. Byrn's book is scholarly and interesting, and records and describes all the more important developments of the useful arts which characterize the period. The influence of invention on modern life cannot be overestimated. The chapters give a very comprehensive, compact, and coherent account of the progress which distinguishes this as the "golden age of invention," resulting in an industrial and commercial development which is without precedent.

A chronological calendar of the leading inventions is one of the important features of the work, enabling the reader to ascertain at a glance the most important discoveries and inventions of any particular year. The author is specially qualified for the work by scientific training. The book cites a large number of United States and foreign master patents, thereby giving the best authority for the statements made, as they are based on official records. This has never before been accomplished, and the result is a book which will always be of sterling value as a work of reference. It will prove an addition to any library, specially to that of the inventor. Further particulars concerning the book will be found in another column.

REPORT OF REAR ADMIRAL FARQUHAR ON THE NEWPORT NAVAL MANEUVERS.

[The following extracts from Rear Admiral Farquhar's Report to the Secretary of the Navy contains all the official information which the Department, having in view the best interests of the navy, feels justified in making public regarding the recent maneuvers.—ED.]

To the Secretary of the Navy:

Sir: I have the honor to submit the following report of the combined maneuvers of the Army forces in and around Newport and officers and men of the Torpedo Station and class, the War College Staff and such members of the class as remained at the College, and the Squadron under my command. The Commanding Officer of the Training Station placed the "Vicksburg," with her officers and crew, at our disposal, as well as mounting and manning rapid-fire guns in the shore fortifications, and gave every possible assistance in carrying out the exercises. The greatest interest was shown by everyone connected with the maneuvers, and, while realizing that the time was very short and the facilities very far from complete, there was no abatement in the zeal and energy displayed. The departure of the "Kentucky," on the eve of commencing operations, necessitated a change. Captain Folger with the "Kearsarge" taking the place of Captain Chester and the "Kentucky." Lieutenant-Commander F. F. Fletcher, commanding the "Eagle," expressed a desire to participate in the exercises, and was directed to take the place of the "Bancroft."

At 2:00 P.M. Monday, September 24, the Red Squadron, consisting of the "Kearsarge," "Indiana," "Texas," "Scorpion" and "Eagle," accompanied by six torpedo boats, put to sea to establish a blockade of Newport. The remaining vessels, the "New York," "Massachusetts," "Leyden," and "Vicksburg," the last two simulating battleships, were disposed for the defense of the harbor, and arrangements were made for communication between the various forces afloat and ashore to insure active and satisfactory co-operation in defending Newport against the attack of the blockading force. The general plan followed by the Blue (inside) Squadron was to place a battleship on each side of, and just inside, the mouth of the harbor, concealed from incoming vessels, with steam up, battery trained forward, and everything ready to fire into and ram any vessel succeeding in passing the forts. One battleship, the "Vicksburg," was placed just to the southward of Gould Island. Picket boats, armed with rapid-fire guns and sharpshooters, were placed on both sides of her, four hundred yards apart. All picket boats were provided with a system of signals to warn all hands of the approach of the enemy. The "New York" was placed well inside, commanding the full length of the Main Channel, and in a position to go to any part of the field. Picket boats were placed on each side of the Eastern Passage, out of the rays of the searchlights, prepared to destroy or cripple torpedo boats, and to report their approach. A lookout signal station was also placed at Beaver Tail Lighthouse. The Eastern Passage was kept lighted by searchlights from the Torpedo Station, Fort Adams, and Fort Wetherell. The Western Passage was lighted by a powerful searchlight at Fort Greble.

The ships were cleared for action, batteries prepared and manned, and every condition of battle simulated as nearly as possible, though firing only blank charges from small rapid-fire guns. While so much was wanting, both in time and material, to carry out maneuvers on a large scale, there was no lack of zeal and enthusiasm among the men and officers engaged, and a number of very important professional points were brought out that will no doubt be of great value in the future. The army officers were particularly impressed with the value of searchlights, and they had an opportunity of seeing something of their effect when used on board vessels passing forts.

The general plan followed by all vessels was not to turn on searchlights until the approach of a torpedo boat was reported by a picket boat. The plan of placing picket boats was very successful; not a single torpedo boat got by them without being reported. With a sufficient number of searchlights on shore, it is doubtful if vessels could be piloted into a harbor at night that was at all difficult of entrance. The bow wave and wake of torpedo boats was the first object that aided in picking them up in the darkness. In this connection, I would suggest the advisability of the Department's keeping as many torpedo boats or destroyers as practicable with the squadron at all times, to accustom both officers and men with their general characteristics, movements, etc., and in order to carry on exercises with them in all the various ports visited.

The "Holland," unfortunately, in her attack upon the "Kearsarge" the second night did not reach there until after several torpedo boats did. The second night's operations consisted in an attack upon the outside, or Red, squadron by five torpedo boats and the "Holland." As a rule, the torpedo boats were successful, although this would scarcely have been the case with an efficient picket boat service.

INDIGO IN CAMBODIA.

M. Cassier, chief of the French agricultural staff at Cambodia, has recently published an interesting report relating to the cultivation of the indigo plant and the preparation of indigo in that country. The indigo plant is cultivated in all the regions of that country which are covered annually by the fertilizing deposits of the rivers. The crop is highly esteemed, and the natives estimate that the cultivation of indigo brings in three times as much as that of cotton. The fresh stalks contain 1-1000 of the merchant indigo of Europe, but the natives use only the liquid parts for the extraction, which is carried out in the following manner. The maceration tank, which is sometimes a rude native vessel, is filled with the freshly cut stalks, which are piled in horizontally to within 12 inches of the top. Upon them is placed a framework of bamboo which is held down by wedges. The vessel is then filled with water nearly to the top and the whole allowed to stand for 12 to 15 hours. The water becomes a greenish color, and the leaves become brownish. The stalks are then removed, and to the remaining liquid are added 10 to 15 pounds of lime, mixed with water to form a paste. The mixture is stirred to hasten the action, and is then allowed to stand for one hour, when the liquid becomes clear in the upper part, and is decanted off. The remainder, a thick liquid, is then put into a special tank, where the liquid from several operations is accumulated. The mass is stirred, and allowed to rest for twelve hours, when the top liquid is poured off and the remainder is drained off to the consistency of paste in a shallow vessel made of matting or of trellis-work of fine bamboo or reeds. The drying should be rapid, and it is for this reason that the vessel, which is placed on the ground, is only 8 inches deep. In two days the operation is finished, and the paste, which still contains considerable water, is packed in jars. To estimate the efficiency of this method, it may be remarked that a maceration tank holding 250 gallons and containing 200 to 220 pounds of stalks gives 33 pounds of the product sold in Cambodia, which contains only 2·3 per cent of indigotine, the remainder being made up of lime, organic matter and water.

THE SCHOOL GARDENS OF EUROPE.

More than a year ago word was sent to certain consular officers of the United States, residing abroad, to prepare a report upon the founding, progress and practical work of school gardens in their respective districts. The result of their investigations has been incorporated in a handsomely illustrated pamphlet issued by the Department of State.

The subject is a most interesting one, and Sweden, which is the home of garden schools, takes the lead and now has 2,000 of them. Great attention has also been given to the subject in France. Parliament during the Revolution had seriously studied the questions of different forms of education and of establishing courses of agricultural instruction. The hour was little propitious for the development of the peaceful arts, but within thirty or forty years, by their personal efforts alone, without government support, certain public-spirited citizens, by establishing model farms and agricultural schools, laid the foundation of agricultural teaching in France, and the Republic of 1848 passed a law incorporating the teaching of agriculture into the national educational system. School farms increased rapidly, and in 1852 there were seventy, the number allowed by law. From this time, however, they continued to decline until after the Franco-Prussian war, when the third Republic reorganized the entire system of agricultural education. There are 172 professors of agriculture in the primary and secondary schools, 90 professorial chairs of agriculture organized by the government, 42 agronomical stations and laboratories, besides veterinary schools, forestry schools, national agricultural schools, dairy schools, schools of practical agriculture numbering 34, schools of irrigation and drainage, schools of viticulture, horticulture, sheep-raising, silkworm culture, fruit-growing, and various stations for the study of seeds, entomology, vegetable physiology, vegetable pathology, laboratories for the study of fermentation, etc. In 1893 the government expended $828,104 for agricultural education in France. The Paris agronomical institute has 22 professorial chairs, and the course of instruction is two years. Foreigners are received under the same conditions as French scholars.

The reports from the different parts of Germany are most interesting. Germany has to fear competition from other countries in all agricultural products except fresh vegetables, and everything is being done to revive and sustain agriculture. The school gardens through the country are made a part of popular education in connection with the public schools; and whether they are merely botanical gardens to supply material for study in the schools, or agricultural gardens conducted by the children, they are more a part of the regular school routine than in the great number of schools in other countries. In Breslau there is a botanical garden of nearly 12,000 acres, and three-quarters of the ground is planted with flowers for use in school. Plants are sent at the request of the teachers, and the children are taken to see the plants growing. The scholars also receive plants to take home, and the pupils most interested receive an extra number. There is a model institution in the suburbs of Dresden where boys are taught the cultivation of all the forest and fruit trees that grow in the kingdom of Saxony, and the girls have charge of the vegetable garden, and learn to plant, hoe and weed, and all the children are instructed in the care of flowers. There is a section of the garden devoted to plants for botanical purposes. The children take great pride and interest in their work, and after the outdoor season is over, they are given bulbs and plants to take home to grow as indoor plants. The school gardens of Germany are intended more as a help to studies already in progress than as an extra course, as in the agricultural gardens of France. In Leipzig the botanical garden is of large extent, and the teachers of botany can take the children there for practical instruction, and they are allowed to take away anything they desire for study. The school board sends out a circular twice a week, giving a list of flowers in bloom, in order to encourage visits to the garden. Transplanting and grafting trees are taught by seeing the gardeners work, and the children are encouraged to cultivate little vegetable plots at home. In Munich spacious playgrounds are provided, and all new school buildings have 20 square feet for each pupil. The school grounds in the suburbs are very large and are well planned. Half of the schools have botanical gardens, and a large central garden is being started.

In Switzerland the government gives a substantial contribution for every garden which is established and also gives a yearly sum toward its maintenance. The estimated cost of these gardens is less than $500. This includes the expenses of hotbeds, summer houses, railings, fountain, plants and seeds, utensils and labor. In some cases the pupils have assisted in preparing the garden.

The following are some of the advantages of the system: The children obtain an intimate knowledge and intercourse with nature, they learn about the cultivation of fruits and vegetables. It educates boys beyond the tendency to pilfer fruits and flowers in orchards, and instills in all children a fondness for rural life.

THE destructive action on iron of free carbonic acid in water has recently been considered by Herr O. Kröhnke, whose report appeared in a German paper. The author analyzed the town's water of St. Johann, and found it to be pure and soft. The free carbonic acid amounted to 38 milligrammes per liter, and three months earlier it had been as high as 240 milligrammes per liter. This water reduced the diameter of an iron pipe from 26 millimeters to 7 millimeters in a short time, owing to the formation of a brown crust, while the pipe itself was corroded to a depth of from 1 millimeter to 3·5 millimeters. Tested in a closed vessel, this water was found to dissolve wrought iron very rapidly with formation of ferrous bicarbonate. On exposure to the air, ferric hydrate was precipitated and carbonic acid regenerated.