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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.

## UNIVERSITIES IN THE UNITED STATES AND GREAT BRITAIN.

Our English contemporary, Nature, in a recent article, makes a statistical comparison of the provision for university education in Great Britain and the United States, in which some truly remarkable results are shown. We were well aware before reading this article that in the wealth of their endowment, in the completeness of their equipment, in the numbers and qualifications of their professorial staff, and in the total enrollment of students, our universities were well ahead of those of the older country; but we were not prepared for such remarkable disparity as is shown in the article referred to. It seems that in the United Kingdom, with a population of 41,000,000, there are 25,500 university or university college students, or say five to each 10,000 inhabitants, while in the United States, with 76,000,000 inhabitants, there are 97,100 students, or 12.76 for each 10,000 inhabitants. After commenting on the important bearing which these facts must have upon the struggle for industrial supremacy, our contemporary proceeds to point out that the amount donated by private individuals for higher education in the period from 1871 to 1901 was eight times greater in the United States than that given for similar purposes in Great Britain; while, to say nothing of the income from state land grants, the amount provided by the state for higher education in the United States is six times as much as the government grants for the same purpose in Great Britain. In the older country there are but 13 universities and 20 university colleges, whereas in the United States there are 170 colleges with an endowment of over \$100,000, and 49 of these have endowments of over \$500,000, while three of them have an endowment of over \$10,000,000. Even more significant is the fact that the value of the endowments of the institutions of higher education in the State of New York alone exceeds the total value of endowments for education raised during thirty years in the whole of Great Britain; while the same thing may practically be said of the States of Massachusetts and California. Perhaps the most striking comparison is that from which we learn that the total number of professors and instructors in universities and colleges, included in the list of the United States Commission of Education, is 17,000, whereas the number of day students in the university and university colleges of Great Britain is only about 20,500, so that there are almost as many university teachers in the United States as there are university students in Great Britain.

Of the many institutions of our country of which we are justly proud, there is none, surely, more splendid than our system of public school and university education. Even in Germany, of whose educational advantages we have lately heard so much, there are only 7.87 university students to each 10,000 inhabitants, as compared with 12.76 in the United States.

## THE ALDERMAN AND THE ENGINEER.

When the present city administration came into office, it found two of the largest suspension bridges in the world in course of construction or about to be built across the East River, neither of which, unfortunately, could lay claim to architectural or æsthetic beauty. The first of these, popularly known as the New East River Bridge, was so far advanced that it was too late to make any radical changes designed to improve its appearance. Of the other, now known as the Manhattan Bridge, only one of the foundations was under way; and the new bridge commissioner, who is one of the foremost bridge designers in the world, took advantage of the backward state of the work to cancel the old design, which possessed no æsthetic beauty whatever, and drew up plans for a new structure, which has the double merit of possessing great architectural merit, and embodying features in its design and materials of construction that will insure its completion in a much shorter time than

would have been possible under the old plan. Among other changes, the new design contemplates the use of steel chain cables instead of steel wire cables, and the greater speed of construction is due chiefly to the use of that type. Although at first sight this may seem like a return to an earlier and discarded form of construction, it is, as a matter of fact, a distinct advance in engineering practice; improved methods of manufacture, and the use of nickel-steel, render it possible to build a chain cable of the same strength as a wire cable, which will compare favorably with the former in point of cost, will weigh not so very much more, and will have the advantage—extremely valuable just now when there is such a call for improved communication across the river—of being capable of construction in considerably less time.

It was inevitable that such a bold and radical change as this should provoke criticism. The engineers who were responsible for the rejected design and also for that of the present East River Bridge, to say nothing of the contractors for the wire cables, could hardly be expected to look with a favorable eye upon such a sweeping change. In view of the inevitable criticism that would be provoked, the Mayor very wisely appointed a commission of three of the most eminent bridge engineers in this country to pass upon the new plans. They have recently returned a favorable report; and it would now seem the time is surely ripe to push forward this too-long delayed work to completion. Unfortunately the question of appropriations has to be determined by a Board of Aldermen, which, in spite of its distinctly lay character, has undertaken to criticise both the architectural and engineering features of the bridge, features upon which, in the very nature of things, it is quite unable to express an intelligent opinion. The Municipal Art Commission has passed favorably on the architectural elements of the bridge, which, by the way, were especially designed under its supervision, and the engineering features are indorsed by the leading bridge engineers of the day. The obvious duty of the Board of Aldermen is, then, to confine itself to its duty of voting the necessary funds for construction, and thus do its part toward hastening the construction of one of the most urgently needed public works of the day.

## THE NEW ARMY RIFLE.

It is stated that during our campaign in Cuba there were no less than half a dozen different kinds of rifles represented in the American army of invasion. The fact that two entirely different types—the Krag-Jorgensen and the old Springfield rifle—constituted the main armament of our troops, the former being used by the regulars and the latter by the volunteers, was in itself a sufficient handicap to place our troops at a serious disadvantage, particularly when it is borne in mind that the weight, range, and rapidity of fire of the two weapons were widely different. Hence, it is encouraging to learn that the government has definitely decided to adopt the new army rifle of which we gave an illustrated description in the SCIENTIFIC AMERICAN of June 6. The new weapon is a most excellent piece, greatly excelling, as we showed at the time, the best of the existing military rifles on every point of comparison. It is shorter (only 24 inches long in the barrel), lighter, has greater velocity, greater energy both at the muzzle and at the longer ranges, than the Krag-Jorgensen, the celebrated Mauser, or the very excellent German military rifle. The new Springfield rifle, is to be supplied to the regular army just as fast as it can be turned out from the government arsenal, which, if working at its capacity of 200 rifles a day, could supply our army of 60,000 men in about one year's time. The Krag-Jorgensen rifles of the regulars are to be passed on to the National Guard, and they will carry them until the regular army has been supplied with the new weapon, when the volunteers will be supplied with the new rifle in their turn. The advantages of arming the National Guard as well as the regulars with the same pattern of rifle, especially when it is such a magnificent weapon as this, are obvious.

## THE GROWTH OF OUR FOREIGN COMMERCE.

The indications are that the foreign commerce of the United States for the year will prove to be the largest in the history of the country, the total imports exceeding, for the first time, a total of \$1,000,000,000, and the exports being larger than in any preceding year except 1901. Taking the trade figures for the eleven months of the year, it is evident that when those for the month of June are added, the total exports will amount to about \$1,400,000,000. The largest total commerce representing the imports and exports combined of any previous year was that of 1901, when they amounted to \$2,311,000,000. During the first year of the century, our total trade amounted to \$162,000,000. In 1850, it had grown to \$318,000,000; in 1860, to \$687,000,000, and in 1872, for the first time, it passed the billion-dollar line. In 1880 it had increased to \$1,503,000,000, and in 1900 it first passed the two-

billion dollar mark, the total being \$2,244,000,000; while in the present year, as we have said, it seems likely to exceed \$2,400,000,000.

## A SHIP CANAL THROUGH SCOTLAND.

In addition to the two great canals which are likely to be built on the American continent at Panama and between the Great Lakes and the Hudson River, there is now under consideration, with the approval of the British government, a scheme for building a ship canal through Scotland, from the Firth of Forth to the Clyde, at an estimated cost of \$50,000,000. This is not the first time that the idea has been mooted. The favorable topography of the country between the two great estuaries, coupled with the great advantages, commercial and military, to be secured by cutting this waterway, have naturally attracted the attention both of the British government, which has looked at the scheme from the view-point of its great strategic advantages, and of the capitalist, who has always been fully alive to the commercial facilities afforded by such a short cut from the North Sea to the Atlantic as would be provided by a Forth-Clyde canal. The British Admiralty is now constructing a great naval base on the Firth of Forth for the use of the North Sea fleet, and the cutting of the canal would at once double the strategic value of this base, since it would enable the fleet to reach the Atlantic by steaming a distance of only forty miles. Commercially, the canal would be valuable as opening up a direct route from the North Sea to Canadian and New England ports.

## DESTROYING THE WATER HYACINTH BY A NEW CHEMICAL PROCESS.

During the last year experiments have been tried under the supervision of the government, with the idea of ridding the southern waterways of the hyacinth. As is well known, the variety known as the water hyacinth spreads so rapidly and has such a rank growth, in Florida and Louisiana, that it has seriously interfered with navigation and in some cases has completely blocked streams which had hitherto been available for the use of light-draft steamers.

The hyacinth has been especially troublesome on the St. Johns River, where various schemes have been tried to destroy it. One of the plans was to equip a steamboat with a propeller provided with blades having very sharp edges, with the view of cutting away the growth below the surface. It was believed that this treatment would cause the plants to die, but the benefit was only temporary. While lanes of open water were made by the action of the rapidly moving propeller, they were soon filled with the hyacinth and this scheme was abandoned. At some of the smaller wharves on the St. Johns, the growth has been so thick that it has been necessary to go out in boats and cut away with sickle and knife a large area, in order to allow a vessel to moor at the dock, while some of the smaller wharves have been abandoned, as the plant grows so thickly about them that a boat driven by quite powerful engines is in danger of becoming blocked in the midst of a bed, unable to extricate itself.

The method which is now being tried, however, seems to have solved the problem of how to destroy the hyacinth, and it is believed that if sufficient equipment is provided, eventually all of the southern water courses may be cleared of the pest permanently. A chemical has been compounded which has such an effect upon the plant that if it comes in contact with the stem or blossom these portions soon wither; but the solution is so powerful that it works its way down the stem, killing the root as well. Some of the ingredients of the chemical are known only to the inventor but a large quantity of acid is used in its preparation. The process of manufacture is very simple, the "laboratory" being placed upon a barge provided with two tanks each of which has a capacity of 5,000 gallons. Connected with the tanks is a boiler in which the ingredients are mixed at a high temperature produced by steam heat. The barge is of such light draft that it can be towed by the spraying boat if desired, but the latter is provided with three reservoirs each holding 3,500 gallons, which are filled by pumping from the barge. Pipes lead from the reservoirs to a steam pump which supplies the spraying apparatus. This consists of three booms. One extends directly in front of the vessel, being supported by a block and tackle attached to the bow deck. The others project from the sides of the vessel. The sprayers consist of hollow tubes which are perforated at intervals of about a foot and the holes fitted with miniature nozzles. The liquid is forced into the sprayers through lines of hose which are connected to the sprayers by couplings in the usual manner. The arrangement of the sprayers is such that the chemical can be distributed over a space 90 feet in width when the boat is moving. The boat containing the spraying apparatus is of the type of craft used on southern rivers, drawing but 4 or 5 feet of water. She is provided with very powerful engines in proportion to her size in