

NEW YORK HARBOR.

The Chamber of Commerce some months ago was petitioned by a large number of merchants and agents of shipping to take some action looking to the erection of an enlarged and, if possible, more convenient channel into this port. Its committee on this subject called a public meeting, and formed a large general committee on harbor improvements and protection, embracing a number of the most influential men connected with public affairs and commerce. This meeting also resulted in an earnest petition to Congress, asking that the

Secretary of War be authorized to advertise for and "contract with responsible parties for the speedy deepening and widening of a channel to afford 30 feet depth of water and not less than 500 feet in width at mean low tide, which would afford 35 feet and a width of 1,500 feet at high tide, in and through that part of the bay at Sandy Hook which experience and judgment indicate as best calculated to be permanently maintained by nature alone after the first guiding and aiding works have been constructed." It was intended that nothing be paid until the object be partly attained—the profits and a large proportion of the expense to be entirely dependent upon the self-sustaining character of the work. The necessity for such relief has been most apparent and pressing for a long time, and it only needs to glance at the change which has taken place in the requirements of vessels (Fig. 1) to be strongly impressed with this fact. The memorial was forwarded to Congress and presented in the House, but as yet no specific action has been taken. The Chairman, Mr. A. Foster Higgins, of the Standing Committee of Harbor and Shipping, caused to be initiated on behalf of the Chamber of Commerce of New York a simple, plain, and business-like way of grappling with the subject. Two years ago, work was commenced by having a series of historical maps and models made. These clearly indicate the areas on which extensive improvements might be undertaken. The numerous maps, extending back 150 years, embrace the entire harbor from Long Branch on the south to Yonkers on the north, the east side of Jamaica Bay on the east and Raritan River, just west of Perth Amboy, on the west. There are also sectional maps giving all the changes that have taken place in the outer bay between Sandy Hook and Coney Island from 1735 to 1884. The alterations in Coney Island and Sandy Hook are especially interesting as clearly showing how important their protection and retention are to the maintenance of the present and improved depths in the outer bay. Although these maps cover the larger part of the subject, it is still necessary to make con-

tinuous and simultaneous tidal and current observations in order to secure the factors with which to calculate the velocity, direction, volume, and exact effect of each separate body of water upon each channel or upon any harbor works that might be erected.

This important map work was followed by the carving in wood of several models. The accompanying illustration is a photographic reproduction of the general small scale model, $3\frac{3}{4}$ inches to the mile, which represents an area of 800 square miles inclosed within the limits above mentioned. The heights and depths of

the force and directions of the currents passing between Sandy Hook and Coney Island, which are distant from each other 7 miles. The accompanying outline map, or key to the large view, will serve to make the following description plain.

The outer bay is scoured by two great forces—one, from the inner harbor through the Narrows, made up of the Hudson and East River, Long Island Sound and Newark Bay waters, and the other, from the outer harbor, a compound of Raritan Bay, Raritan River, and Arthur Kill waters with those from Sandy Hook Bay and the Shrewsbury and Navesink basins. Both of these forces pass seaward between Sandy Hook and Coney Island, being divided by the Dry Romershoals, and it is estimated that the quantities of flood tide waters are almost identical on either side of the shoal, while the ebb tide waters are from ten to fifteen per cent stronger over the east bank and through the channels north than through the channels on the south side of this shoal. It is probable that none of the waters that pass through the Narrows on the ebb tide ever flow south of this shoal, except at the seaward end of the bar, and under special conditions, such as high freshets or the backing up of the waters by unusual winds. The water flowing through the Narrows, although coming from three distinct sources, may be regarded as a single stream running in a southerly direction so far as the effect on the channels of the outer bay is concerned. The outer harbor waters, on the other hand, are divided into two independent forces which only unite on the same course as they elbow their way through the opening between Sandy Hook and Coney Island, the Sandy Hook force running northerly directly opposite to the inner harbor waters, and the Raritan Bay force easterly and



A, NEW YORK CITY. B, BROOKLYN. C, JERSEY CITY. D, NEWARK. E, STATEN ISLAND. F, CONEY ISLAND. G, SANDY HOOK.

BIRD'S EYE VIEW OF NEW YORK HARBOR, WITH WATER REMOVED.

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at right angles to both, these latter waters squeezing their way between the others and forcing them to assume like itself an easterly direction and keep their own side of the way. The constancy of these forces is shown by the fact that the sand bar fronting the entrance has maintained its position and depth with very slight variation during the past fifty years. This bar is the result of the flood tide from the ocean and storm wave power on the one hand as opposed to the ebb tide and freshet power on the other.

The extensive inner bar, west and alongside of Flynn's Knoll, has during the past 150 years, with two doubtful exceptions, only varied 3 feet in depth. The Dry Romer has been nearly equally constant. The outer bar, or Gedney's Channel, has not varied 4 feet during the above period.

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are the Main Ship and Swash, Gedney's Channel giving them common access to the ocean across the outer bar. The former, although much longer and requiring five different courses to navigate it, is principally used, owing to its deeper water. A third channel, called the East, requiring only two different courses, was only known in an official and published form in 1835, when the work of the U. S. Coast Survey was begun. During the past fifty years this channel has proved the most constant of the three; the deep water area had, as shown by a careful comparison of official surveys, improved twelve per cent in 1857, fifteen per cent in 1872, and 30 per cent in 1884 over its state in 1835. The depth over the bar fronting it, the only obstruction to a free and unimpeded channel to the ocean, has deepened about 2½ feet.

In response to the general demand for more water, there are to-day several proposals for effecting the required relief. Probably the oldest plan is to build an artificial bar well out in the ocean to prevent the storm sand from being driven on the natural bar; another is to dredge a channelway through the outer and inner bars of the ship channel, and protect the places so dredged by submerged jetties; a third is to run stone dikes northeast from Sandy Hook and thus contract the entrance; a fourth is to let the existing channels alone and to dredge out and maintain by jetties the East Channel, thereby obtaining nearly a direct line into New York; a fifth, and last, the construction of a stone dike running south-southeast from Coney Island for a distance of about 4 miles across the entrance, to greatly confine the waters and force them to scour the channel out. These plans cannot be all right, or even reasonable; some would probably ruin the port. It would therefore seem prudent, considering the enormous interests involved, to ascertain without delay the exact movements and relations of the forces to each other as affecting the several channels. The question arises, apart from the great saving in distance, whether the East Channel is not the best one to improve; only one set of waters from the inner harbor passes through it, and there is no collision of currents to cause deposits; while the Main Ship and Swash channels have two and three conflicting forces at work over their area. But before any particular method is adopted, it would certainly be wise and prudent to acquire, by a series of accurately made and extensive observations, an absolute knowledge of the velocities and directions of the moving waters at every depth. The problem to be solved is how to improve one of the existing channels with the least possible disturbance of the present regimen of the harbor. The run of the tides must be coaxed by science, and not opposed by brute force.

There is a bill now before Congress, introduced by Senator Warner Miller, authorizing the appointment of a commission of five practical men, to consider the best means for preserving the harbor from injury by dumping and other abuses which impair its usefulness, and also from time to time to report any improvements that may be desired to the Secretary of War, who shall transmit them to Congress. Three of the five will be officers of the U. S. Engineer Corps, the Navy, and Coast Survey departments appointed by the President, and two will be civilians nominated by the Governors of New York and New Jersey, a board eminently fitted to consider the question of permanent improvements.

Any work that would augment the commerce of New York by providing a shorter, deeper, and in every respect a better entrance to the harbor would be of national importance, and should therefore be undertaken by the general government, under whose control it very properly belongs, and not by the States of New York and New Jersey.

The rapid increase in the draught of large ocean steamers and the sharp competition in speed of the several lines make necessary the deepening and straightening of the channel if we still desire these vessels to anchor at our docks. Even now the largest vessels can only come in during certain stages of the tide, and the least deviation from their course insures grounding.

If we do not desire their presence, an active indifference will in a very short time compel them to seek other harbors. The builders of steamships have attained speed and size to satisfy public demand, and they will not be likely to sacrifice these features by so changing their models that they may easily enter New York Harbor.

By a very careful test it, has been found that the strength of a Bushman's forearm compares with that of an Englishman of the same weight as 55 to 85.

The Proposed Permanent Exhibition of the Three Americas.

On the 4th of March, 1889, the Constitution of the United States will have completed the first century of its existence, and on the 12th of October, 1892, four centuries will have elapsed since the discovery of America by Columbus. These two anniversaries are events of the greatest importance in both the history of the United States and of the world. It is therefore thought eminently fitting that they should be celebrated by the nation at large, in a manner suited to the dignity of its position. The approach of two occasions of such historic interest has been the incentive of a number of proposed exhibitions in different American cities. New York, St. Louis, Chicago, and the city of Mexico have each started

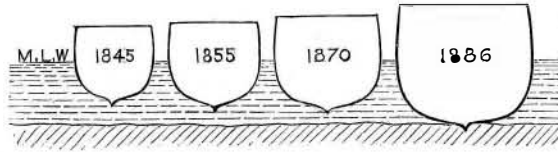


Fig. 1.—SECTIONS SHOWING GROWTH OF OCEAN STEAMERS.

movements toward the organization of expositions in honor of one event or the other. But the importance of the one, affecting equally the entire United States, and of the other, being the dawn of history for the whole hemisphere, makes a more concerted and widespread celebration desirable than could be attained by a private corporation or by local enterprise. The proposition has therefore been made, and is now under Congressional consideration, that the celebration of these two anniversaries shall be undertaken by the general Government, and shall take the form of a grand Permanent Exhibition of the Three Americas, intended not only to commemorate the common starting point in their several histories, but to serve not less for drawing them together into closer commercial and political relations.

The city of Washington has been appropriately named as a suitable location for such a gathering. It is a city in which we all have a common interest; and in no other place could a celebration be so entirely a national affair, and so devoid of local or sectional feeling, as on national territory. The peculiar

created an atmosphere of learning, which attracts an increasing number of students and investigators.

It is quite time that some decisive action should be taken if the occasion is to be observed in a fitting manner. Less than three years remain before the completion of the constitutional century. We can do little more than inaugurate the movement by 1889, but by 1892 it should reach a grand consummation worthy of our land and hemisphere. It is proposed that, on this occasion, the President of the United States, the presidents of the fifteen American sister republics, the Emperor of Brazil, the Governor-General of Canada, the King of Italy, in whose domain Columbus was born, and the Queen-Regent of Spain, from whose country he set sail, shall unite in unveiling a colossal statue of the illustrious discoverer of America, to be erected in the center of the permanent exhibition grounds at Washington.

Relation of Mechanics to Architecture.

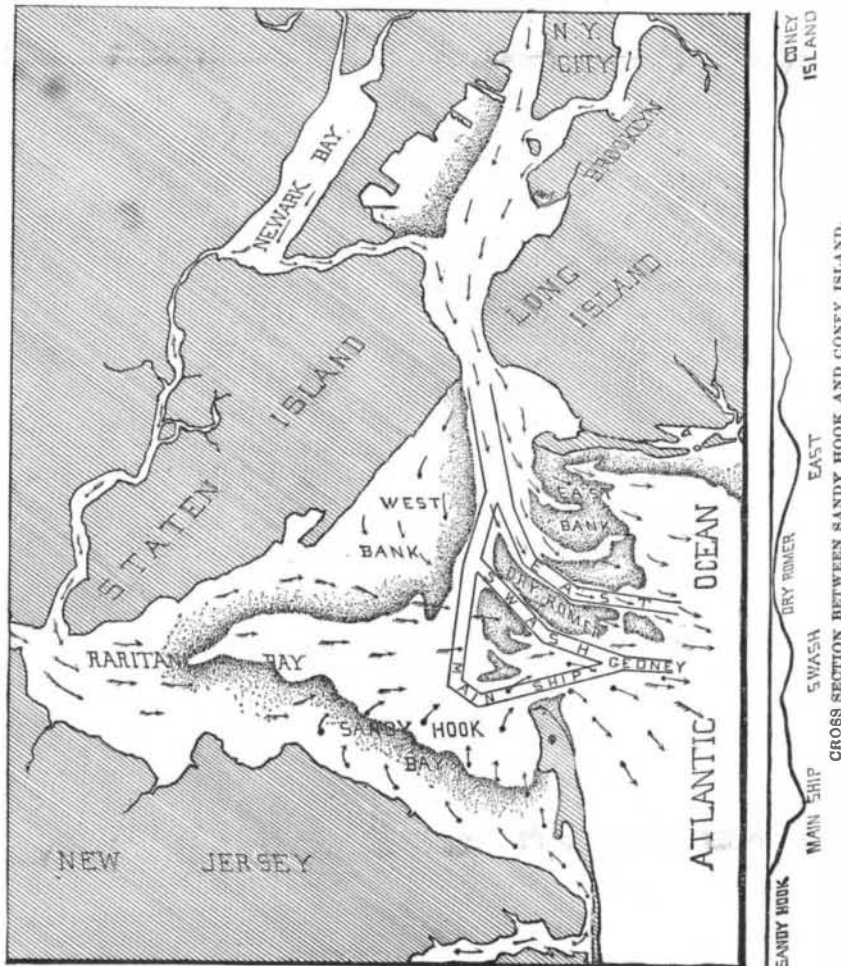
The different styles of architecture may to a certain extent be distinguished and classed according to the kind and the greater or less complexity of the principles which regulate the stability of the structure. The simplest kind of stability is that of a single mass resting on a base; this is exemplified by pyramids, obelisks, and solitary pillars. Next in point of simplicity is the stability of a load resting on a lintel whose two ends are supported by pillars, each of sufficient dimensions to be stable in itself. This we find exemplified in Egyptian and Greek architecture, and in those examples of Roman architecture from which the arch and dome are absent. The next degree of complexity consists in supporting the load on each pier of which the structure consists by a pair of pressures inclined to each other—that is, by introducing the arch and dome—and this we see in later examples of Roman and Italian architecture, and in various styles of the earlier middle ages, such as the Byzantine, the Lombard, and the Anglo-Norman.

The perfecting and extending the application of the arch, so as to sustain the entire load of the higher parts of the structure by means of the thrust exerted through ribs suitably formed and arranged, characterizes Gothic architecture. The balancing of overhanging loads is seen to a certain extent in the beetling bartizans and turrets which form the most picturesque feature of the Scottish baronial style. The balancing

of bulky arches upon comparatively slender pillars, whose lateral stability depends very much on their connection with the mass above them, is characteristic of Saracenic architecture. The styles of framework in roofs and in buildings of wood and iron might be classed in a similar manner, according to the way in which the principles of statics regulate the stability of the structure. Another mechanical characteristic of styles in architecture is the way in which the strength of the materials is exerted. In the obelisk, pyramid, and simple tower or column, resistance to crushing is also brought into play; and the same is the case with the most elaborate combinations of ribs, groined arches, and tracery in Gothic architecture. In the styles which employ architraves supported by pillars, the transverse strength of lintels or beams is also employed. The support of overhanging loads requires the transverse strength of corbels and cantilevers, and in some cases the tenacity of cement and cramps. Timber and iron framework bring every form of strength into requisition. A subordinate distinction of styles, founded also on mechanical principles, depends on the hardness and durability of the material of the building. For example, a certain plainness of style, which if executed in granite constitutes majestic simplicity, appears poor and bare in sandstone, and paltry in brick.—*Professor Rankine, in the Architect.*

Fast Time.

The master car builders held their annual convention at Niagara Falls recently, closing June 11. The Western members were taken by a special train of four cars over the Great Western Division of the Grand Trunk, and a remarkably fast run was made: leaving Niagara Falls at 9:45 A.M. and arriving at Windsor, a distance of 229½ miles, at 2:55 P.M.—5 hours and 10 minutes, including stops, of which there were 13, and three of them 17, 10, and 8 minutes respectively. Excluding stops, the run was made in 3 hours and 57 minutes—or 229½ miles in 237 minutes. With the exception of 11 miles on the Copetown grade, a uniform speed of 60 miles an hour was maintained throughout, and the roadbed is in such excellent condition that the cars ran so steadily that it was observed water in a glass nearly full on the table did not spill.—*Toronto (Ont.) Railway Life.*



MAP SHOWING CURRENTS, NEW YORK HARBOR.

character of the city, moreover, specially adapts it to such a purpose. The large parks and government reservations, containing in all about 1,000 acres, are located right in the heart of the city, so that the exhibition buildings would be more easily accessible than would be possible elsewhere. Their permanency likewise would be a most desirable feature at the national capital, since it is becoming each year more and more the scientific, literary, and social center of the entire country. The treasures gathered in such an exhibition would therefore be seen and enjoyed by a greater number of persons from all parts of our extended territory than could possibly be the case in any other locality. Already the presence of such institutions as the Smithsonian, the National Museum and Library, and the Patent Office has