THE NEW YORK HARBOR ENTRANCE.

BY LEWIS M. HAUPT.

Nearly a score of years has passed since the SCIENTIFIC AMERICAN took a leading part in the popular agitation for deeper channels to this port, when the Chamber of Commerce passed resolutions requesting Congress to authorize the Secretary of War to advertise for a channel 30 feet deep and 500 feet wide, "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."

This action was made necessary by the fact that "the largest vessels were obliged to wait for the tides, and the least deviation from the channel insured grounding." Although much progress has been made since that date, and the depths in the bay have been increased from 23 to 30 feet, still the demands of the vessel have far outrun the capacity of the channels, as may be seen from the following exhibit:

Name.	Length.	Beam.	Depth.	Draft.	Displacement.	Speed.	Year.
	Feet.	Feet.	Feet.	Feet.	Tons.	Knots.	
La Bourgogne	492	52	38			18	1886
Paris	560	63	42	26½	13,000	20	1888
Campania	625	65	41½	28	19,000	22	1893
Oceanic	704	68	49	32½	28,500	20	1899
Baltic	725	75	49	36½	40,000	20	1904 *

* The above statistics are from "The Scientific American Reference Book," just issued by Munn & Co., of New York.

A Cunard Line steamer is under contract to be 790 by 87½ feet, by 60 feet molded depth.

The structural limit for safety, economy, and speed has not yet been reached because of the retarded development in channel and port facilities. Loss of time in port or deficient loading will soon offset the economy of additional capacity of vessel.

To the loaded draft there should be added about four feet for "squat," when running at full speed, and four more for clearance in rough water, making a total of about forty feet necessary to meet modern requirements. It will soon be forty-five at present rate of growth.

The estimate submitted in 1886, for a dike to improve the bar at Gedney's Channel, was so great and the location so objectionable that it was not built, although the board had little confidence in dredging, for it stated: "The Board of Engineers has little expectation that anything more than temporary relief can be obtained by dredging on a bar exposed to the full force of the Atlantic, and hence cannot recommend that method for permanent improvement."

Nevertheless, relief was so urgent that recourse was had to dredging, with the result that in the last annual report (1903) it is said (page 140):

"The estimated cost was $1,400,000 for dredging 4,300,000 cubic yards. The actual amount dredged to October, 1891, when the work was approximately completed, was 4,875,070 cubic yards. . . . The cost of maintenance is estimated at $50,000 annually."

So that in about four years there were removed some 400,000 yards more than the original estimate contemplated, which may have been due to drift. "The amount expended up to July 1, 1903, is $1,939,757.63." The estimates were based on 50 cents a cubic yard for dredging in Gedney's, and 40 cents in the Main Ship channels.

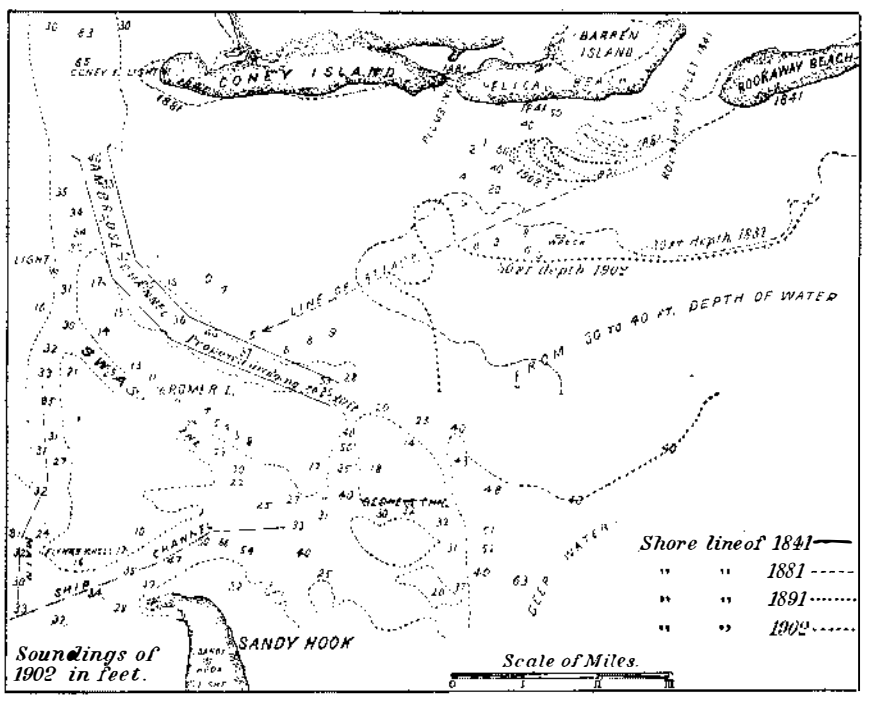
Under *Maintenance*, the report states (page 910): "During the year the 'Gedney' has removed 197,384 cubic yards of material, as follows: From Main Ship Channel, 25,615 cubic yards; from Gedney's Channel, 60,180 cubic yards; from Ambrose Channel, 111,580 cubic yards. The cost of operating the 'Gedney' in Ambrose Channel has been, up to July 1, 14.7 cents per cubic yard of material excavated. The cost for the four months, December to March, was 20.5 cents per yard, and during the months April to June it was 10.7 cents."

So that the expenses of merely operating the dredge were in every instance more than the present contract price paid to private contractors, which is but nine cents, including all fixed charges of deterioration, interest, insurance, dredging beyond limits, for which 17 per cent has been deducted, and incidentals. From the above it would appear to be self-evident that the government work cannot compete with that of private contract, or else the latter is obliged to assume risks which are in fact reckless, to make time, whereas the government may only work in favorable weather and for short hours. The record also states that the "Gedney" could work but 109 days out of the entire year, or only 30 per cent of the daytime. Reducing this to the hour basis at eight hours per diem, it will give but 10 per cent of the year, while the forces of nature are at work all the time in their efforts to re-establish the normal conditions of equilibrium.

To open Gedney's Channel originally required the removal of 350,000 cubic yards, so that if the 60,180 removed represents the accretions of a whole year, it would require only about six years for the channel to be closed. As this shoaling is on the south side, it indicates clearly the source of the drift, and also confirms the correctness of the views of the Board of Engineers as to the temporary character of the work to be expected from dredging.

Under these conditions, and the greater length and shallowness of the Main Ship Channel, an act was finally passed in 1899 providing for the opening of the Ambrose (then known as the East) Channel to a width of 2,000 feet and depth of 40 feet, requiring the removal of 42,500,000 cubic yards at an estimated cost not to exceed $4,000,000, thus necessitating bids at less than 10 cents per yard.

A contract was let for this work May 12, 1899, at nine cents per yard, work to begin July 1, 1901, and payments conditioned upon a rate of excavation of 4,000,000 yards per year, the government reserving the right to augment the plant at any time. The expiration of the contract is not fixed, depending upon appropriations from Congress.



Note advance of Rockaway Beach toward the proposed channel.

PLAN OF NEW YORK HARBOR ENTRANCE.

"Up to July 1, 1903, $704,098.59 has been expended; . . . 8,995,620 cubic yards has been removed. . . . No result useful to navigation will be obtained until the cuts are carried through the outer bar, which is about two miles across." At this rate of progress it will require about ten years to remove the original volume, if the supply of material is intercepted, but it will be seen that the prospect for a greatly augmented deposit in the near future is imminent.

To expedite the progress, the government has built two dredges estimated to cost $700,000 to construct, and $185,000 to maintain and operate.

The first of these dredges has recently gone into commission in competition with the contractor's plant on the bar. With a smaller vessel, shorter hours, and larger crew, it should furnish some conclusive data as to the relative efficiency of the two methods of conducting works.

THE MENACE TO THE PORT.

It is well known that this entrance bar is the natural depository of the littoral drift from the shores of Long Island and New Jersey, and that a mere local, mechanical removal thereof will not permanently improve the channels, so that the question of the amount of this drift is of primary importance. This involves a comparative study of the rate of progress of the great deposits which encircle the inlets, especially of the south shore of Long Island, but space does not permit of details.

The charts show that Fire Island Inlet has drifted to the west at the average rate of 200 feet per annum. Rockaway Inlet has traveled west as well as south, at the rate of three miles in sixty years, or nearly 260 feet per annum, and it is fast encroaching on the entrance, which it will seriously throttle in its mailed hand, so suggestive in the plans. These progressive movements are best seen in the cut showing the erosion of Pelican Beach, the overlapping of the former coast line and the shoaling of the former great depths. A wreck in 3 feet of water now marks a former depth of 37 feet, and channels of 40 feet depths are now fast land. The shoaler water, as this bank approaches the bar, will expedite its progress, while its line of action, produced, will cut the proposed channel in twain. The question is one requiring immediate and serious consideration, and it is not one which can be met by an attempt to compete with natural forces by dredging. This movement should be arrested before it has gone further, since the natural dumping ground for the littoral drift, which was Jamaica Bay, is now closed to it.

Before the 40-foot channel can be opened this menace will be much greater, and it would seem to be the part of wisdom to give serious consideration to the possibility of opening and maintaining the channel by "nature alone," assisted by suitably located training-walls, which will not obstruct any of the channels nor interfere with the tidal ingress in the least, and which can be built at less than one-half the cost and time of this temporary expedient, if estimated at profitable prices.

Forestry and the Railroads.

Upon the advice of the Bureau of Forestry the Gulf, Colorado and Santa Fé Railroad eight months ago began to experiment with wooden tie-plates. These plates are intended to protect the tie from wear under the rail. They are cut the width of the bottom of the rail and as long as the tie is wide—usually 6 or 7 inches—and are kept in place by the weight of the rail, in a flat groove in the tie. The results of the experiment are of much interest both to the railroads of the country and to those who have at heart the cause of forest protection.

The Santa Fé placed cypress tie-plates one-quarter of an inch thick on several thousand old and much-worn cypress ties laid in its track north of Galveston, Tex. After eight months of constant use the plates are perfectly sound and show practically not a trace of wear. The officials of the road are greatly pleased with the result of this trial.

The Bureau of Forestry will now make similar experiments with red gum, red oak, and beech tie-plates, which will be placed in the tracks of the St. Louis and San Francisco, the Burlington, and the Northern Pacific systems. These are all harder woods than cypress, and are therefore less liable to wear under the rails, but are much more subject to decay. The tie-plates made from these woods will therefore all be heavily creosoted. This will make them about as resistant to decay as the untreated cypress, while their much greater hardness will better qualify them to resist the wear of the rails.

For a number of years cross-ties have been treated with preservatives, and tie-plates of iron have been used to increase their length of service. Tests are constantly being made by the Bureau of Forestry to improve the character of the preservatives and the methods of their application, and to enlarge the number of woods used for railroad construction purposes. Experimenting with wooden tie-plates is work along the same economical line, in the interest of both the railroads and the forests. The use of a tie-plate prevents wear on the tie and adds years to its service; wooden tie-plates are being successfully substituted for the more expensive iron; and abundant and cheaper woods, through preservative treatment, are becoming available to take the place of scarce and expensive woods. When a wooden tie-plate is worn out a new one can be quickly and cheaply inserted in its place. In Europe these plates cost but $2 a thousand, or $2 for every 500 ties, since two are used upon each tie. Preservative treatment keeps the tie from decaying, the wooden tie-plate keeps it from wearing, and the use of both will result in a huge economy for the railroads, which will react favorably upon our forests.

M. Laubeuf, the chief naval architect of the French Admiralty, and designer of the "Narval," the most successful of the French submarines, has devised a new type of submarine of greater speed, and capable of more rapid submersion than those at present in commission. The new vessel resembles in general appearance the former boats, but is fitted with special mechanism which enables it to be completely submerged within two minutes, as compared with seven or eight minutes occupied by the old models. The craft is propelled by motors developing 250 horsepower with a speed of 16 knots.