

PORT AUTHORITY LIBRARY



THE PORT OF NEW YORK AUTHORITY

CREATED BY COMPACT BETWEEN THE STATES OF
NEW YORK AND NEW JERSEY AND RATIFIED BY CONGRESS

ANNUAL REPORT FOR THE CALENDAR YEAR 1926

PART I

Development and Protection of the Port Under the Comprehensive Plan

PART II

Relating to Bridges

GEORGE S. SILZER
Chairman

JOHN F. GALVIN
Vice-Chairman

FRANK C. FERGUSON

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JANUARY TWENTIETH, NINETEEN TWENTY-SEVEN

ALBANY
J. B. LYON COMPANY, PRINTERS
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THE PORT OF NEW YORK AUTHORITY

COMMISSIONERS

GEORGE S. SILZER
Chairman
FRANK C. FERGUSON
SCHUYLER N. RICE

JOHN F. GALVIN
Vice-Chairman
OTTO B. SHULHOF
HERBERT K. TWITCHELL

JOHN E. RAMSEY
Chief Executive Officer

JULIUS HENRY COHEN
Counsel

WILSON J. VANCE, Secretary
WILLIAM LEARY, Treasurer
DAVIS L. WATERS, Asst. Treasurer
MARION RODGERS, Auditor

TECHNICAL STAFF

BILLINGS WILSON, Deputy Manager
W. W. DRINKER, Chief Consulting Engineer
OTHMAR H. AMMANN, Bridge Engineer
GEORGE W. GOETHALS, Consulting Engineer
WILLIAM H. BURR, Consulting Engineer on Bridges

E. J. TSCHIMBKE, Chief Clerk

NEW YORK, January 20, 1927.

*To the Governor and Legislature of the State of New York:
To the Governor and Legislature of the State of New
Jersey:*

Herewith the Port of New York Authority submits its annual report for the calendar year 1926, together with financial statements related to its activities under the Comprehensive Plan and to the interstate bridges, which the States have directed it to build. For convenience the annual report is divided into two parts, the first dealing with development and protection of the port under the Comprehensive Plan, and the other giving detailed information concerning the bridges.

The Port Authority came into existence in 1921 under the compact between the States, which resulted from the studies of the port problem and the recommendations for its solution, by the New York-New Jersey Port and Harbor Development Commission. Active work began the following year when the Comprehensive Plan for the improvement and development of freight terminal facilities within the district took final form and the Port Authority was directed to effectuate its provisions.

In every step contemplated by the Comprehensive Plan, the Port Authority has been governed and in a sense restrained by the necessity of adhering to the rule of economic practicability. It cannot order an improvement made or construct a facility itself, unless the change is economically sound. The gathering of the data constituting the economic proof, their correlation, analysis and presentation, have in instances required a long period of the most arduous searching and study.

Belt Line No. 13, the first physical step in the Comprehensive Plan, was unified through the Port Authority's efforts in 1925 and since then shippers and the trunk lines terminating in the New Jersey section of the port have had the advantage of a ready interchange of freight.

The plan for an improved freight service for Manhattan has so far advanced that it seems probable the first unit of the series of Universal Inland Freight Stations in that borough will be launched shortly.

The proceeding to open the Hell Gate Route, giving Long Island shippers direct rail access to territory west of the Hudson River, and instituting a part of Belt Line No. 1 of the Comprehensive Plan, has been carried to the point that decision from the Interstate Commerce Commission and the Public Service Commission of New York is now awaited.

Surveys have begun for Belt Line No. 1, the backbone of the Comprehensive Plan, which when duly constituted and operated will permit of all-rail freight shipments from any point in the port district to any other.

The principle of reserving the facilities within the Port district for the use of the commerce thereof was strengthened by the examiner's report in the Maybrook case, which favors routing of "alien" freight around and not through this district.

The question of food supply and distribution has been studied exhaustively and scientifically, with the cooperation of other agencies and producers, carriers and dealers are agreed on the necessity of better methods and greater facilities—the form or types of which are now being studied.

The port district and the commerce thereof have been protected against many adverse movements—proceedings for freight differentials, unjust terminal charges, efforts to divert business and the like—by appearances before the Interstate Commerce Commission and other tribunals.

Studies of the railroad carfloat and lighterage service, in progress for several years, have been brought to a point where great savings to be accomplished by unified tug operation are clearly established. The findings on this question are to be presented to the representatives of the road. We expect the railroads will act to realize the advantages apparent to them and to the public.

The New York Central's plan for improvement of its freight line on the west side of Manhattan has been sub-

mitted to the consideration of a committee consisting of engineers representing the railroad company, the City of New York and the Port Authority. While the physical and technical aspects of the project alone receive consideration from the committee, substantial progress in bringing the West Side Improvement into harmony with the Comprehensive Plan has been gained, it is believed.

Studies for a new ferry to operate between Brooklyn and Jersey City, enabling goods and passengers to make the trip between those points without using Manhattan's congested streets, were made during the past year. That there exists a great demand for such a service is evident and the Port Authority hopes to be able shortly to announce its establishment.

The progress made upon the interstate bridges which the Port Authority has been directed to construct is given in detail in Part II of this report. It may be said here that the Arthur Kill Bridges having been fully financed, construction was begun in the fall and a satisfactory rate of progress has been maintained. Funds for the early stages of construction of the Hudson River Bridge have been provided for by undertakings of the two States to advance \$1,000,000 each available on July 1, next and the sale of Port Authority bonds in the amount of \$20,000,000, and contracts for the substructure are expected to be let before the summer. Studies have been almost completed for the bridge across the Kill van Kull from Bayonne to Port Richmond. It is hoped that a full report upon this project will be ready shortly.

The multiplication of duties necessitated during the year a reorganization of the Port Authority forces and a removal to new quarters to secure adequate room.

In May last, Julian A. Gregory, who became a Commissioner in July, 1923, and had been Chairman since November 19, 1924, retired from the Port Authority, his resignation having been accepted by the Governor of New Jersey and his successor having duly qualified. The Commissioners felt an unusual sense of loss in the retirement of Mr. Gregory, though they fully appreciated the pressing

reasons that moved him to sever his relations with the Port Authority. On May 27, the following resolution was unanimously adopted:

WHEREAS, Pressure of private affairs has compelled the retirement of Julian A. Gregory from the Port of New York Authority, his resignation becoming effective as of this week; and

WHEREAS, During the whole period of his service with this body, beginning on July 18, 1923, and especially during the time when he served as Chairman, from November 19, 1924, to date, he was distinguished by an extraordinary zeal for the public interest, an instant and yet profound grasp of the problems to be solved by the Port Authority, a remarkable sense of justice and equity and a judicial poise which enabled him to hold the balance true among rival sections or communities and conflicting interests; be it

Resolved, That the Commissioners of the Port of New York Authority hereby express their profound conviction of the loss to the public service involved in the retirement of Mr. Gregory, and their belief that in a very real sense he has left his mark upon the public record and that the fruit of his labors can not fail to be a permanent public benefit; and further, that they express their keen regret at the severance of official relations, which have been in all ways and at all times agreeable and inspiring; and

Resolved, That this resolution be entered upon the minutes of the Port Authority, and a copy, suitably engrossed and duly certified, be presented to Mr. Gregory.

There is a growing recognition of the Port Authority's usefulness for bringing about improvement within the port district, and the great value of such an institution in bringing about cooperation between the States. There are also evidences that local communities, transportation agencies, shippers and other commercial interests are realizing more and more the benefits of cooperative effort based upon thorough analysis of situations where remedial measures are needed.

The Port Authority has been able to serve a number of communities, in the course of the year, in the matter of

making thorough technical studies of conditions which it is desired to improve and in cooperating to secure definite improvements and extensions of the facilities for handling commerce.

The effectuation of the Comprehensive Plan and the construction of the bridges and similar works which the Port Authority has undertaken under the direct mandate of the states are duties which are of capital importance. There are countless other results, however, which the Port Authority can bring about or aid in bringing about, and which properly fall within the scope of its work. The securing of deeper and broader channels in the waterways of one section, the construction of warehouses and manufacturing buildings with rail and water facilities in another, the relocation of railroad freight lines and rearrangement of yards may be regarded as purely local matters, yet such, if properly conceived, will add to the facilities for handling commerce within the Port of New York District, will reduce the cost of doing business and will tend to reduce the cost of living. They must always be a matter of concern and interest to the Port Authority.

The Port Authority takes this opportunity of inviting a closer cooperation on the part of the several communities within the port district, the commercial organizations, transportation and business interests, to the end that needed improvements for developing commerce may be accomplished.

In the succeeding pages will be found information in detail concerning the various projects in which the Port Authority is engaged and other activities which it is carrying on.

Respectfully submitted,

The Port of
New York Authority

{ GEORGE S. SILZER,
JOHN F. GALVIN,
FRANK C. FERGUSON,
OTTO B. SHULHOF,
SCHUYLER N. RICE,
HERBERT K. TWITCHELL,
Commissioners.

PART ONE

**ANNUAL REPORT OF THE PORT OF NEW YORK
AUTHORITY FOR THE CALENDAR YEAR 1926**

**DEVELOPMENT AND PROTECTION
OF THE PORT OF NEW YORK
UNDER THE COMPREHENSIVE PLAN**

PART ONE

ANNUAL REPORT OF THE PORT OF NEW YORK AUTHORITY FOR THE CALENDAR YEAR 1926

DEVELOPMENT AND PROTECTION OF THE PORT OF NEW YORK UNDER THE COMPREHENSIVE PLAN

Development of the Port

Substantial advances were made during the year in respect to several of the principal projects under the Comprehensive Plan. The work of selecting the best route for Belt Line No. 1 with reference to grades and other topographical features began with surveys in the western side of the Port. The plan for universal inland freight stations for Manhattan was brought to a point where the establishment of the first unit in this system may shortly be announced. The staff was able to present data, based upon the studies of the carfloat and lighterage service of the railroads in New York Harbor, showing savings of some millions of dollars and more efficient operation by the pooling of tug boat equipment and the application of flotilla towing to lighterage. An improved system of operation on Belt Line No. 13 was sanctioned during the year. Cooperation was given to the movement to extend the facilities for handling cotton within the Port of New York, thus aiding in preventing the institution of "southern warehouse delivery." Studies of the possibilities of a ferry service between Brooklyn and Jersey City were made and negotiations had for the establishment thereof.

Belt Line No. 1

Surveying parties have started operations to establish the best lines and grades for Belt Line No. 1, which is known as the keystone or backbone of the system of Belt

Lines under the Comprehensive Plan. This facility will, it is expected, begin somewhere in the neighborhood of Little Ferry, N. J., run south, in the territory west of the Palisades and east of the Hackensack River, and turning at Greenville go in a tunnel under Upper New York Bay to Bay Ridge on the Brooklyn shore. Here it will connect with the Long Island Railroad and by means of that road and the New York Connecting Railroad traverse the eastern end of Long Island. Then by means of Hell Gate Bridge and the New Haven Railroad tracks in the Bronx, it will connect with New York Central tracks, giving access to the territory served by that road to the shippers of Brooklyn and Queens.

The tunnel under the Bay will necessarily involve a heavy cost and a considerable period of time to construct. For the time being, therefore, communication between Greenville and Bay Ridge can be effected by means of the existing car ferry augmented to handle the additional tonnage which is expected to use Belt Line No. 1.

Belt Line No. 1 in its suggested course is intended in itself to give rail service to and between all parts of the port, for it will establish connection with all of the railroads in the district. The effort to establish the upper part of Belt Line No. 1 over the Hell Gate Bridge and thus give Long Island shippers access to the territory west of the Hudson River and vice versa is described in another part of the report. Much valuable data concerning the amount of tonnage that can be economically routed over Belt Line No. 1 has been obtained through the study of the carfloat and lighterage problems elsewhere alluded to.

Carfloat and lighterage service

In recognition of the fact that some of the most extensive projects contemplated may require extended periods of time to bring to fruition the Comprehensive Plan imposes upon the Port Authority the duty of devising definite methods of "prompt relief" for the better coordination and cooperation of existing facilities for handling freight.

The carfloat and lighterage service of the several railroads in the port has been exhaustively studied with a view of ascertaining the possibility of improvement of methods and lowering of cost. As a result of these studies the Port Authority is in a position to say that, by pooling a portion of their marine equipment and coordinating operations to a degree, the railroads will be able to give a better service and at the same time save several millions of dollars yearly. Other studies—not yet completed—point to even greater savings and higher efficiency through complete consolidation of equipment and completely centralized and unified operation.

The fleets of the railroads in New York Harbor constitute a real navy. According to the latest reports there are in the service of the several roads 138 tugs, 36 steam lighters, 338 carfloats and 1,199 barges and analogous craft. The present value of this marine equipment is approximately \$30,000,000. The freight handled by the railroad navy amounts in a single year to upwards of 37,000,000 tons. Besides the piers and slips in which the vessels operate, there are required a considerable number of stations on the waterfront for fueling, repairing, disposing of ashes and other purposes.

Each railroad in the port owns and operates its fleet without reference to the marine facilities and equipment of any other carrier. There has been no coordination of effort or pooling of resources. The system naturally produces duplication of effort and interference which it is believed can be largely eliminated.

Tug boats are operating daily in the harbor waters usually with only one to two lighters in tow, whereas many of these vessels are capable of handling tows consisting of ten or twelve lighters. One company's tug often runs light in one direction while that of another company will run light in the opposite direction. The tugs of one company are constantly called upon to proceed to a specific point for switching service when tugs of another company are available in the same location but cannot be thus employed because of separate corporate ownership.

The plan which the Port Authority suggests contemplates the segregation of short tows to and from certain localities with tugs, of lesser capacity than that type necessary for heavy long-haul tows, in flotilla formation. It provides also for the consolidation of tug switching service at terminals, so that the needs of one company can be supplied from the surplus of another. Special shifting tugs would be located away from railheads where steamships and other operations are intensified, thereby providing prompt and efficient switching service without the necessity of waiting for tugs to arrive from distant points to perform such operations.

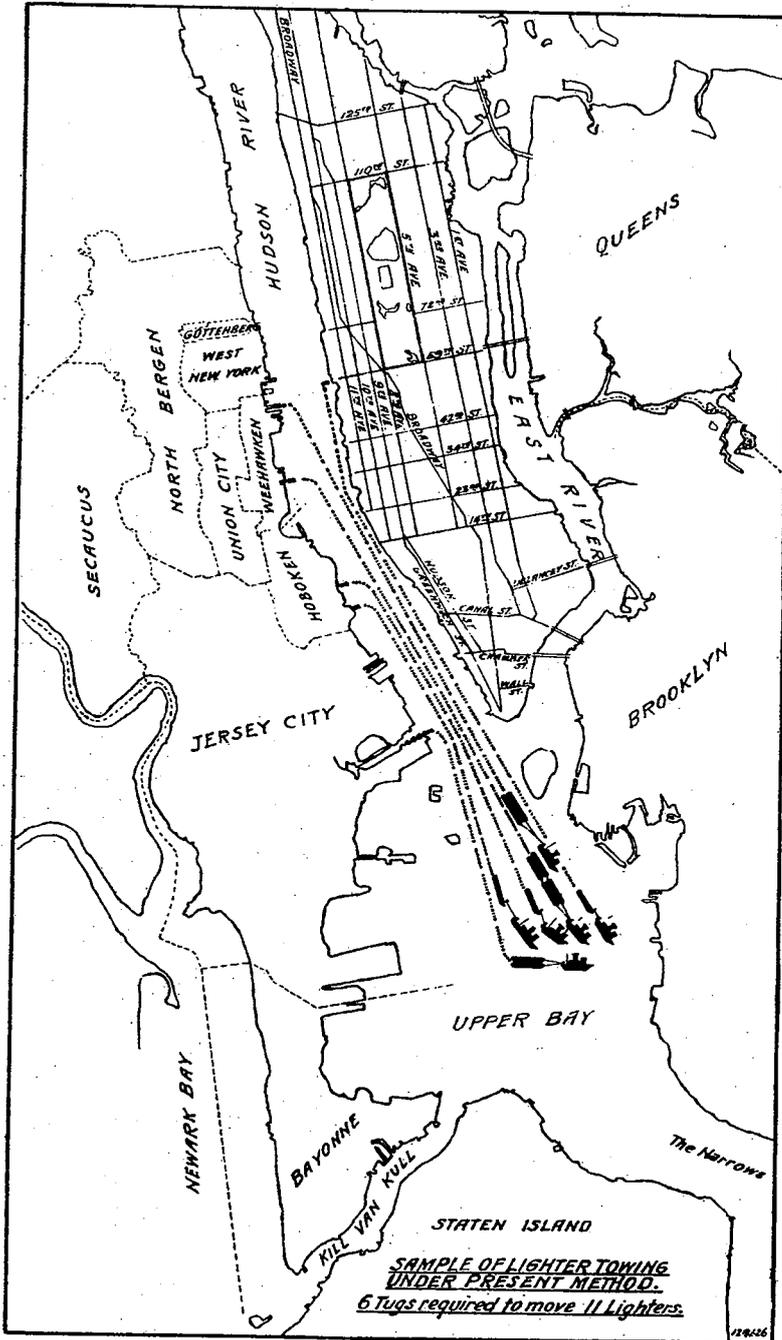
The investigation of this subject has been in progress for several years and the railroads have furnished to the Port Authority statistics as to equipment and operating costs. The data jointly compiled by the Port Authority and carriers' representatives are now in report form, for consideration by the railroad executives.

An analysis of the records and marine operations in October, 1924, has furnished the basis for many of the conclusions reached by the Port Authority staff. According to the figures gathered by the staff, the total cost of towing service under individual railroad operation in that month was \$886,000. The staff finds that the cost with central dispatching and pooling of tug boats would have been \$707,000, hence a net saving for this one month of \$174,000 is indicated.

The following tables presenting some of the results of the analysis of the carfloat and lighterage situation will be found of value in any consideration of that problem:

Annual Volume and Distribution of Tonnage Involved:

Service	Tonnage	Per Cent
Interchange between railroads.....	17,000,000	47
Manhattan, Bronx and Brooklyn Domestic Floatage	8,000,000	22
Lighterage, including Export and Import and Grain	12,000,000	31
	37,000,000	100



Geographic Distribution of Tonnage Excluding Grain and Interchange Return Railroads:

	Tons
Export and Import, excluding Grain, Brooklyn-Queens....	3,913,000
Export and Import, excluding Grain, Manhattan North River side	2,672,000
Export and Import, excluding Grain, other locations.....	2,959,000
Domestic Manhattan North River side.....	4,780,000
Domestic Manhattan East River side.....	1,832,000
Domestic other locations.....	1,354,000

Commodity Classification of Lighterage Freight Excluding Grain:

Eastbound	Tons
Flour	941,000
Packing House Products.....	851,000
Iron and Steel Shapes.....	761,000
Iron and Steel Pipe and Rail.....	314,000
Wire, Bolts, Nuts, etc.....	303,000
Sheet Metal	258,000
Automobiles	268,000
<i>Westbound:</i>	
Sugar	217,000
Crude Rubber	181,000
Chemicals	166,000
Smelter Products	150,000
Paper Stock	142,000
Misc. Products of Agriculture (largely flaxseed).....	390,000

Universal inland freight stations for Manhattan

As was indicated in the last Annual Report, the executives of the several railroads serving the District were invited during the year to consider the plan for the establishment of a number of universal inland stations in Manhattan for the purpose of improving freight service to and from the central borough and reducing the cost thereof. The plan contemplates union stations open to all carriers and to all shippers alike. A Manhattan shipper having consignments to be forwarded by a number of railroads would carry them all to the inland freight station nearest his place of business. There they would be assorted and conveyed to the rail terminals in New Jersey or elsewhere by means of special motor equipment. Inbound freight would be assorted at break bulk platforms at rail terminals and delivered to the inland stations in accordance with the location of the consignees. Direct savings of many millions of dollars yearly were estimated for both

shippers and carriers and many indirect economies were indicated.

As opportunity afforded during the year the proposition was presented to the railroad executives individually and a number of the roads have requested additional data upon the subject which has led to conferences between their technical representatives and the staff of the Port Authority. The Port Authority acknowledges the cooperation of several of the carriers in furnishing information upon which to base calculations relating to use of inland stations by individual roads.

The situation has seemed to justify appraisals of the cost of real estate parcels suggested for the site for the first unit of the universal inland station system. The appraisals have been tabulated and the Port Authority engineers have prepared a "layout" accommodating the standard inland station plan to a specific location. A site to be useful for an inland station must have a certain minimum area and a definite relation of that area to the perimeter and also must be on thoroughfares which permit the maximum number of floors above the street, to be developed for manufacturing, wholesale purposes and the like. The number of floors above although controlled by the streets are again controlled by the ability to serve them by vehicles. The site tentatively studied met the requirements. An estimate of the cost of this first proposed station, including land purchase, construction and overhead, has accordingly been prepared together with estimates of carrying charges. These estimates show that the upper floors can be placed upon the market at prevailing commercial rates.

In connection with the plans for creation of universal inland stations, the question has been raised whether the increased number of trucks moving between railheads in New Jersey and Manhattan Stations might not overburden existing ferry capacity even when supplemented by the Holland Vehicular Tunnel. New highway facilities in New Jersey leading to the Communipaw ferry of the Central Railroad of New Jersey have so increased the traffic

over that line that previous studies of ferry capacity were declared to be inadequate and the opinion expressed that the delay in line under the influx of the additional inland station trucks would be so increased, that previous calculations were no longer representative. For the purpose of checking the present situation a clocking of those ferries was made on July 12, 1926, at the Communipaw terminal and the two Manhattan terminals, Liberty Street and West 23rd Street.

The results of this analysis show that while the delay during peak hours is considerable even at the present time and would be increased even more with the addition of inland station trucks, yet an additional service on the 23rd Street line and a diversion of trucks moving to and from points west of the Hackensack River to the Vehicular Tunnel would so relieve the situation that the inland station trucks could be handled with no additional delay.

West Side Improvement Engineering Committee

The Port Authority has been represented in the West Side Improvement Engineering Committee appointed by Mayor Walker of New York to study and suggest a plan for removal of the New York Central's tracks from the surface of Manhattan streets. This Committee has held many sessions and has given consideration to various suggestions but as yet has adopted no formal plan. The features of the Comprehensive Plan, which have been adopted by both states and which the Port Authority is under their mandate to effectuate, have been explained in their bearing on the West Side project to the Committee. Much progress has been made in bringing about a mutual understanding and agreement upon engineering plans.

Belt Line No. 13

Another step toward unified operation on Belt Line 13 was effectuated during the year whereby through freight train service is now operated between the Pennsylvania yard at Meadows, N. J., and the West Shore Railroad yard at Weehawken in preference to interchange of traffic at Harsimus Cove Trestle, a point approximately

half way between the two yards. The Central Railroad of New Jersey and the Lehigh Valley Railroad are also setting out local cars on the Belt Line thereby increasing operating efficiency by minimizing train and engine mileage. These changes are in line with the Port Authority's plan for improved and more economic freight service within the Port District and are proving helpful.

The original proposal of the Railroad Executives for the appointment of a neutral Director of Operations to have charge of the entire line has not yet been carried out because of the desire of the carriers to test coordinated operations under present methods of individual control. The Port Authority has withheld pressing for the appointment of a Director of Operations until the merits or shortcomings of the present system could be demonstrated.

A proposed revision of the basis for making freight rates in the territory served by this Belt Line is now before the Interstate Commerce Commission in the Eastern Class Rate Investigation (I. C. C. Docket No. 15879).

Hoboken Manufacturers Railroad

The breaking off of negotiations for the purchase by the Port Authority of the stock of the Hoboken Manufacturers Railroad Company which would insure public control of a facility serving the great docks on the Hoboken waterfront of the Hudson River and afford communication with Belt Line No. 13 was fully dealt with in a special report to the Governors of the two states in March last. It is sufficient to say here that the War Department, which holds the stock of the company and controls and operates the facility, imposed conditions which were not only unexpected by the Port Authority but which seemed incompatible with the public interests to the Commissioners. The whole course of the Port Authority in seeking to acquire the Shore Road was dictated by the general policy that such a property should be in public hands and should be operated for the public benefit.

In August last, the War Department advertised a sale of this property at public auction. The conditions set forth

in the specifications of sale again were such that the Port Authority felt that it should not be a bidder. A number of bids were received at this auction. None of them apparently was to the liking of the War Department which has not yet announced the sale of the property. The City of Hoboken submitted a bid for the dock property apart from the railroad, and the Port Authority, holding the view that public possession of any or all the property would be in the public interest, advised the city authorities of its desire to aid in their purchase of the dock property if it could do so.

Handling Silk Traffic on Hoboken Shore Road

Raw silk from the Orient constitutes a highly important traffic to and from Manhattan via rail and carfloat service from the Jersey waterfront, and motor truck between railroad stations and warehouses. The nature of the commodity involves high values and necessarily heavy risk from theft. In order to minimize the risk the United States Testing Company, representing the silk industry, endeavored to secure a warehouse location with direct rail access to all trunk lines.

The only facility providing service of this character within the Port District, that would not involve carfloat service, is the Hoboken Manufacturers' Railroad, often called the Hoboken Shore Road, and after considerable investigation and negotiation, in which the Port Authority Staff assisted, the Testing Company finally secured a suitable warehouse on that road, and commenced operations there in August, 1926.

Since that time the undertaking has proven so satisfactory that at the end of November, thirty per cent. (30%) of the silk traffic entering the Port District was being handled through this warehouse,—avoiding the necessity of carfloat service from New Jersey to Manhattan, trucking from Manhattan stations to warehouses, and return trucking or carfloating to Jersey for distribution.

This development is in line with the Port Authority's plans for reducing terminal costs at New York as it is effecting material savings for both shippers and carriers.

Hoboken Terminal Improvement

Study of application made by the D., L. & W. Railroad for permission to construct a four-track branch line approximately 2/3 of a mile long, connecting its main line with the proposed new freight station and with the present freight yard in Jersey City and Hoboken which was referred to the Port Authority by the Interstate Commerce Commission, resulted in approval. A certificate of public convenience and necessity was issued by the Interstate Commerce Commission on October 9, 1926.

Brooklyn-New Jersey Ferry Project

The desirability of instituting ferry service between Brooklyn and New Jersey which would permit of direct transportation of goods and passengers between the two sections, without adding to the congestion of Manhattan's streets and transit facilities was urged strongly upon the Port Authority during the year, by concerns engaged in manufacture and trade in the neighborhood of the Bush Terminal. The matter was taken up by the Brooklyn Chamber of Commerce and other organizations and a hearing given by the Port Authority in the latter part of the year, to those interested in the subject. It developed that the route most favored for the proposed ferry would be from or near the foot of Atlantic Avenue, Brooklyn, to a central point in Jersey City.

An investigation by the Port Authority staff was made to determine how much traffic would use such a ferry, toll rates which would yield sufficient revenue to support it, amount of capital required for boats and other equipment, charges for pier rentals and other expenses. A report based upon such data and indicating the economic practicability under certain conditions of such an undertaking and the benefits to the public from the service was prepared. Negotiations for the establishment of the Brooklyn-New Jersey ferry are now under way. Slips are obtainable in Jersey City, boats are available and the Sinking Fund Commission of New York, which controls the leasing of an available slip in Brooklyn, has been advised of the Port Authority's activities in the matter.

Closing Drawbridges during Commuter Hours

On March 25, 1926, an application was presented to the War Department by the North Jersey Transit Commission, the railroads, and representatives of New Jersey municipalities and business interests, for the closing of certain drawbridges across Newark Bay and the Hackensack and Passaic Rivers during commuter hours in an attempt to improve local passenger train service between Northern New Jersey and New York.

Strong opposition developed on the part of navigators and business interests that are more or less dependent upon these inland waterways for transportation. The outcome of this opposition was a hearing conducted by the Board of Army Engineers at Newark, on May 7 and 8, 1926.

The Port Authority, which was represented at the hearing, submitted a suggestion that it would be desirable for the Army Engineers before handing down a final decision, to make studies seeking other means of providing the relief sought such as increasing the present clearances of certain bridges so as to minimize the need for opening draws, deepening and possibly changing the location of navigable channels and improving their marking so that there be created an opportunity for more generally distributing navigation throughout the day and night. The application was recently dismissed by the War Department.

Aiding Port Newark

Investigations were undertaken during the year with a view to removing a disadvantage under which Port Newark labors due to the fact that it is outside the free lighterage limits of the Port of New York. Port Newark has railroad tracks direct to ship side, permitting unloading of cargoes into cars which may be shipped anywhere in the United States west of the Hudson River at flat New York Harbor freight rates. On outward bound cargoes, however, extra towing charges in some cases must be paid in order to have goods delivered to ship side by lighter. The Port Authority studies have indicated that export traffic

could be back-hauled by rail from the Hudson River lighterage terminals to Port Newark more cheaply than it could be lightered to the majority of steamship piers within lighterage limits where it now goes. The study of one road indicates an average cost of lighterage to the

Chelsea Piers, North River.....	\$2.83 per ton
Average cost of lighterage to Bush Docks.....	2.22 per ton
Estimated cost of rail movement to Port Newark	1.29 per ton

All that is necessary to bring about a change that would place Port Newark on equal terms with other steamship terminals within the Port District is a change in the printed tariff rule, but such cases seem always to require protracted negotiations to secure action by the carriers. To date the matter has been handled by the Newark Chamber of Commerce with our assistance.

Cotton Warehouse Delivery

A committee from the New York Cotton Exchange brought to the attention of the Port Authority in June a proposal to use "Southern Warehouse Delivery," in satisfaction of New York "futures" contracts. It was feared that if this proposal were adopted by the referendum vote of the members to whom it was being submitted a large part of the cotton trade would be diverted from this port. After a thorough investigation of the subject, a letter from the Chief Executive Officer of the Port Authority was addressed to the Board of Governors of the Cotton Exchange which after disclaiming intention to interfere in internal affairs of that body called attention to the fact that the effect of the proposed change would mean the subtraction of about 200,000 bales of cotton annually which is now handled here, a loss of about a million dollars in terminal revenues and about 20,000,000 dollars in the gross commerce of the port. The referendum vote was against a change.

Thereupon, the New York Cotton Exchange executed a twenty year contract with the Bayway Terminal at Elizabeth, N. J., for the handling and storing of cotton. Under the contract the Bayway Terminal becomes the exclusive licensed warehouse of the New York Cotton Exchange to the extent of its capacity for all cotton shipped to the Port of New York against contracts for future delivery. A three million dollar issue of bonds has since been floated for the Bayway Terminal to finance additional floor capacity, a ship basin and a cotton compress. Construction work on these improved terminal facilities has been started, and, when completed, should enable New York to compete favorably with any other America port in the handling of cotton.

Protection of the Port

Because of its vast commerce the Port of New York is constantly subjected to attacks which seek to divert business from it in the interest of other ports. Some of these attacks come in the open form of applications for railroad rate differentials or increases thereof, others are more or less veiled and may arise unexpectedly in the course of hearings on subjects which might not at first glance suggest any bearing upon the interest of this port district. The protection of the port, always of great importance, in consequence becomes a matter requiring great vigilance and the Port Authority in the year past as in previous years has felt obliged to watch closely a number of proceedings inaugurated before the Interstate Commerce Commission. Among these are the Great Lakes Grain Differential, the Eastern Class Rate Investigation, and the Iron and Steel Rate Differentials. The status of these actions together with other proceedings is indicated in the pages immediately following:

Hell Gate Bridge Route

In view of the failure reported last year of the railroads to carry out the findings of the Port Authority in its Docket No. 2, relating to the use of the New York Connecting Rail-

road and the Hell Gate Bridge for western and northern traffic to and from Long Island, the matter was laid before the Interstate Commerce Commission and the Public Service Commission of New York which held a number of joint hearings in New York in February, March and April 1926. Witnesses from the Staff of the Port Authority and many others from commercial concerns and organizations from Long Island testified to the practicability and desirability of opening this route which would not only give Long Island all rail connections with the West, but would be a step in the effectuation of Belt Line No. 1 of the Comprehensive Plan. The railroads while admitting the physical possibility of opening the route offered testimony seeking to show that it was undesirable from an operating standpoint. After the close of the hearings briefs were submitted on behalf of the Port Authority requesting that the Interstate Commerce Commission and the Public Service Commission should find among other things:

1. That the industrial growth of Long Island has been such that its constantly increasing requirements cannot be met by the use of carfloat routes, operation of which at times is completely suspended.
2. That the military, commercial and industrial importance of Long Island and the reasonable needs of its people, demand an all-rail route to and from the west.
3. That the Hell Gate Route is a practical route, all parts of which are now being used for interchange freight service.
4. That the use of the Hell Gate Route would be an important step in the effectuation of the Comprehensive Plan.
5. That the Hell Gate Route is virtually closed because of the prohibitive rates exacted for its use; and that disagreement over divisions should not be permitted to deprive the public of the service of reasonable rates.
6. That the time and cost of handling interchange

freight via the Hell Gate Route is less than via the present carfloat route.

7. That the yards and other facilities appurtenant to the Hell Gate Route are adequate to accommodate the additional traffic that could be reasonably expected; and that the alleged operating difficulties are mostly of a trivial nature, and such as are daily encountered and overcome in freight train operation.

8. That the facilities of the New York Connecting Railroad, including the Hell Gate Bridge, represent an investment of over \$30,000,000 and that they are used to only a small fraction of their capacity, due to lack of traffic, which in turn is due to the selfish policy of the proprietary companies in their determination to exclude New York Central-Long Island interchange. This additional traffic would go a long way in helping to make up the annual deficit that the New York Connecting Railroad incurs.

9. That the existing rates via the Hell Gate Bridge Route between Long Island and points in New York State are unreasonable and unduly prejudicial to New York State shippers and unduly preferential to New England shippers because, for like distances, the rates to and from New York State points are substantially higher than the rates to and from New England points, applicable over this only all-rail route.

Decision in this case is awaited.

The port charges investigation

At the request of the United States Shipping Board, the Interstate Commerce Commission recently instituted an investigation of unusual importance involving accessorial terminal charges at North Atlantic ports. This was in effect an extension of an investigation which the Commission had already initiated regarding port charges at the southern ports. One of the major questions involved is the contention of the Shipping Board that charges for warehousing and other accessorial terminal services should

be published separately from the line-haul transportation rates. This contention raises numerous important questions. For example, is the lighterage of freight at the Port of New York an accessorial service for which a separate charge should be imposed, or is it virtually an extension of the line-haul service and, in effect, a substitute for terminal switching? Should the long-standing practice of publishing through export rates to shipside be discontinued? Should the carriers be required to separate their charges for warehousing and other accessorial services from their line-haul rates?

As yet it is impossible to say exactly what course the investigation will follow, but since the question of terminal costs is likely to play an important part in the proceeding, it is probable that Philadelphia and Baltimore interests will contend that there is a relationship between this investigation and the *Port Differential Cases*. A hearing in this proceeding will be held during March, 1927, and the Port Authority is preparing to participate and to defend the interests of the Port District.

Great Lakes Grain Differential

Of great importance to the Port of New York is a preliminary report of the Interstate Commerce Commission examiner in the Boston Grain Differential case (I. C. C. Docket 13548). If the report be confirmed by the Interstate Commerce Commission, the ruling may be expected to improve conditions in the grain trade through the removal of a handicap which has existed for some time.

The action was brought some years ago by the Maritime Association of the Boston Chamber of Commerce and the New York Produce Exchange was allowed to intervene. The conclusions of the examiner were that, while all-rail grain rates should be maintained, rates on ex-lake grain from Buffalo, N. Y., to New York and Boston were unreasonable and should be reduced to the same level as those

to Philadelphia and Baltimore, a reduction of $\frac{1}{2}$ c per 100 pounds.

On ex-lake grain, the examiner re-affirmed the Commission's contention that most of the ex-lake grain is of Canadian and northwestern United States origin, and therefore the mileages to eastern seaboard ports via Buffalo are almost the same.

The abolition of the differentials between Baltimore, New York and Boston will put all the North Atlantic ports on the same basis on ex-lake grain.

The average movement from the Lakes to New York during the last five years has been about 79 million bushels per annum. The saving in freight cost to New York concerns, if Examiner Hosmer's report is adopted, will be \$236,000.00 per annum.

The Baltimore Chamber of Commerce, however, has recently filed a formal complaint alleging that Baltimore differentials are inadequate and should be increased, and asking for a separation of terminal charges from line haul rates at Baltimore and New York. This proceeding, which is a direct attack on the Port District and which brings into issue matters already before the Commission in connection with the Port Charges Investigation, will be heard early this year, and the Port Authority will be represented at the hearing.

The Eastern Class Rate Investigation

The hearing in the Eastern Class Rate Investigation in which the Port Authority intervened to protect the Port District in its rate relationships with other ports and to secure equitable rate structures within the district, have been completed and the preliminary report of the Interstate Commerce Commission is now awaited.

The fundamental importance to the Port District of this investigation cannot be too greatly emphasized. So far as long-haul freight rates are concerned, the Port Authority is urging that the district is an economic and commercial unit and that such rates be grouped to embrace the

district as a whole. In regard to short-haul rates, it is urging that they be made upon a uniform and consistent basis and is endeavoring to establish such a basis. The proceeding involves the proper grouping of short-haul rates within the district and other important questions which cannot be adequately summarized.

Iron and Steel Rate Differentials

In a recent Interstate Commerce Commission proceeding (*American Motor Body Corporation v. The Baltimore & Ohio Railroad Company, Docket No. 18031*), the complainant alleges that the rates on iron and steel articles from Pittsburgh district to Philadelphia are unreasonable. Since the Port District is in keen competition with Philadelphia in the handling of such articles and since iron and steel rates are generally speaking key or basic rates, the Port Authority has intervened to protect its rate relationship, and has succeeded in having the complainants go on record to the effect that they do not desire a change in the differential between Philadelphia and New York. In fact the complainants advocated a continuance of existing relationships, adopting a completely satisfactory attitude. Since the completion of the hearings however the complainants have requested the merger of this proceeding with another of broader scope recently inaugurated by the Commission.

The Maybrook Route Case (I. C. C. Docket No. 16721)

As was stated in last year's report, the so-called *Maybrook Route Case* was brought by the Central Railroad of New Jersey against the New York, New Haven and Hartford Railroad Company to require an interchange of freight through the Port District. In order to avert congestion in the district the Port Authority intervened, supporting generally the New Haven's contention that the Maybrook Poughkeepsie Bridge route was more suitable, maintaining however that storage of cotton in transit at

the port was desirable and should be established. The movement of cotton through the Port District is increasingly important and a very substantial business may be developed, not only for export but for consumption in New England. Up-to-date facilities for the storage and treatment of cotton in transit are being developed and cotton so handled should not be regarded as foreign to the district in making freight rates.

While it has developed that the Jersey Central Railroad Company is interested primarily in the traffic originating on its own line which cannot conveniently move over the Poughkeepsie Bridge route, it is hoped that the Port Authority's action has at least forestalled any increase of the use of the East River by western and southern traffic moving to and from New England. The preliminary finding of the Commission indicates that its final decision will accomplish this result, although it has failed to make the exception urged in the case of cotton.

Motor Bus and Motor Truck Investigation

The operation of motor trucks is increasingly important, not only in connection with railroad transportation as a whole, but in connection with the terminal transportation problem as it affects the Port District. Already several of the trunk line carriers have supplemented their ordinary deliveries of freight in the district with motor truck service.

The Interstate Commerce Commission has instituted a comprehensive investigation of motor truck and motor bus operations (Docket No. 18300), holding hearings throughout the country. The Port Authority has taken no position as to whether these operations should be subjected to federal regulation, but at the New York hearing submitted for the information of the Commission evidence showing in detail the relation between motor truck and railroad service in the Port District.

Other Matters*Food Terminals*

In keeping with our past interest in the improvement of fruit and vegetable terminal facilities, the staff participated in a discussion of fruit and vegetable terminal requirements for the New York district, attended by growers, shippers, railroad executives, leading members of the wholesale and jobbing trades and public officials, on June 14th and 15th. At the close a resolution was adopted that "the exchange of views in connection with facts pertaining to the subject should be continued under official auspices to work out a satisfactory program of terminal relief." The conference expressed the opinion that this matter should be the special concern of the City of New York, the Port of New York Authority, Erie, Pennsylvania and New York Central Railroads, the New York Terminal Sub-Committee of the Fresh Fruits and Vegetables Committee of the Atlantic States Shippers Advisory Board, the Terminal Committee of the New York Fruit and Produce Trade Association, and the Board of Commerce and Navigation of New Jersey.

Members of our staff have inspected new perishable terminal facilities at Chicago and Philadelphia for the purpose of obtaining suggestions helpful to the New York situation.

The staff was represented at the Annual Meeting of State Market Officials in Chicago in the latter part of November, contributing a paper on "Lowering City Distribution Costs."

In order to ascertain the terminal requirements of the butter, cheese, and egg trade conferences were held with a committee representing the Mercantile Exchange. Facts in regard to receipts and storage were laid before the conference. A general discussion of viewpoint took place. Ground has been broken for selection of a working committee to go into the subject more thoroughly.

Adequate all-rail access to Long Island for the delivery of milk direct to pasteurizing plants has come to the fore-

front in connection with the proceedings looking to the re-establishment of the Hell Gate route. One of the principal milk distributors testifies that two-thirds of his milk delivered in Brooklyn has to be trucked from New Jersey. Another distributor in a public statement emphasizes the desirability of direct access to this section by all-rail route as follows:

“For the vast population of Brooklyn, Queens and Long Island suburbs, practically all the milk must be trucked long distance twice—once to the pasteurizing plant located in that territory and again to a delivery branch near to the ultimate consumer. In some cases this milk must be trucked as much as twenty-eight miles. It is estimated that the average quart of milk reaching Brooklyn or Queens’ consumers travels on trucks at least fourteen miles, exclusive of the distance travelled on retail delivery wagons. In these outlying areas of New York, and particularly in the boroughs of Queens and Bronx, the increasing population of Greater New York is finding homes. It is to these points that milk is now being trucked such long distances. Unless something is done to improve rail transportation, the outlook is for more and more trucking.”

In July one of the large milk companies moved its first tank car of milk into the city, but finds the utilization of this system hampered by lack of rail access to the pasteurizing plants.

The New York City Live Poultry Commission Merchants’ Association has requested the Port Authority to advise it with regard to concentration and relocation of live poultry terminals. This traffic is in excess of 10,000 cars a year and is scattered at the present time among four principal terminals, with resulting duplication of handling forces. The association is helping to assemble the necessary records for an analysis and report by the staff.

Food Handling Research

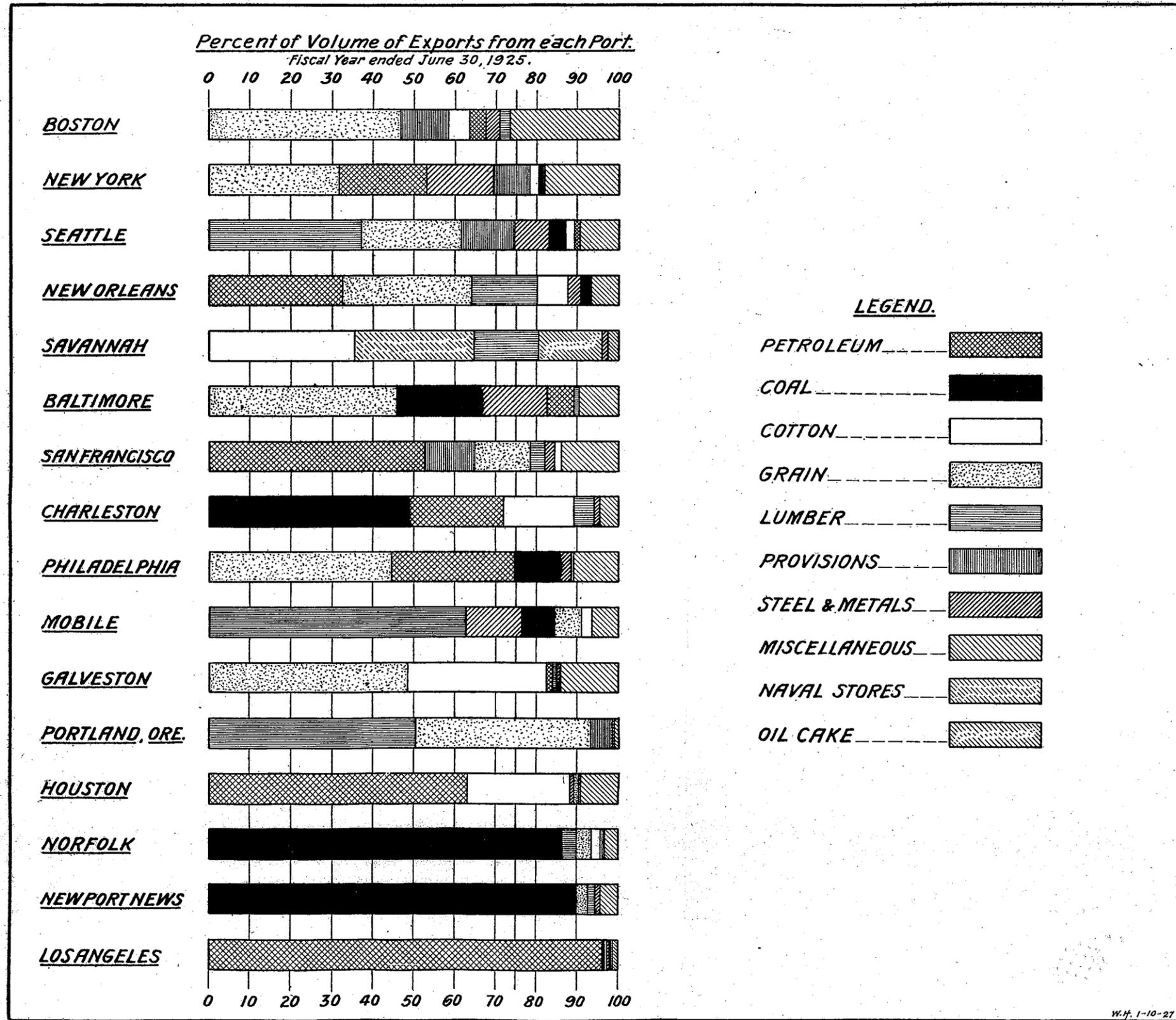
To foster improvements in some of the wider aspects of food distribution the Port Authority has continued its

cooperation with the United States Department of Agriculture and five other public and educational institutions in maintaining headquarters and staff for the New York Food Marketing Research Council.

During the year important meetings were held under the Council auspices, one being devoted to discussion of the subject of the Supply and Potential Demand for Milk in New York City and the other Fruit and Vegetable Terminal Requirements for the New York District. At both meetings important data were presented and there was a general interchange of knowledge on particular phases of the subjects considered, by representatives of shippers, carriers, wholesalers, jobbers and public officials. A conference on the intermarket distribution of fruits and vegetables was held on December 14th. At that time the possibility of better distribution of carlot shipments between eastern markets to prevent seasonal accumulations, terminal congestion and over or under supply was considered. Six studies were completed during the fiscal year ending June 30, 1926, and embodied in the Annual Report of Council. Much of the information contained in the studies is being utilized by the trade with excellent results in the way of reducing the cost of handling these stuffs.

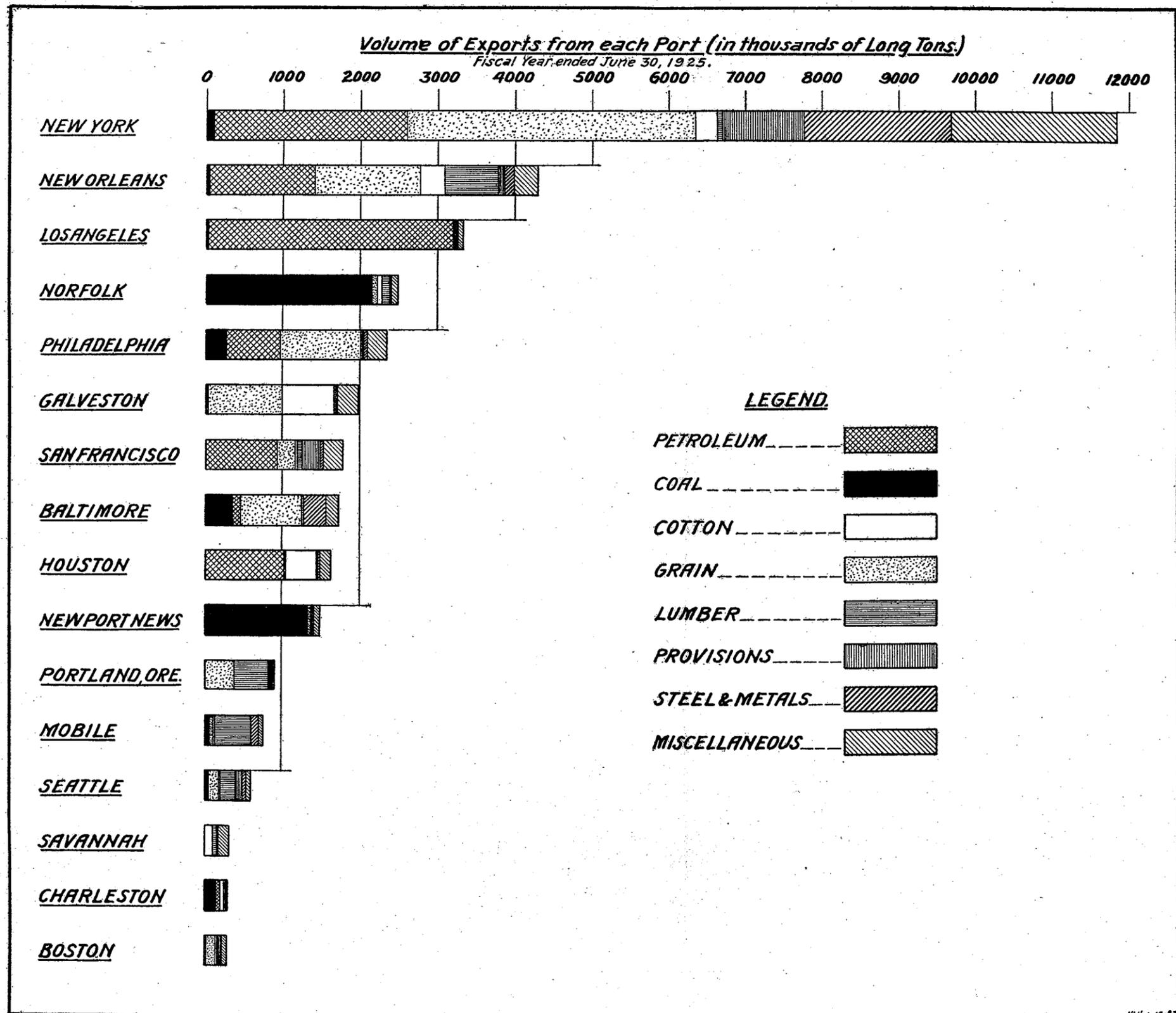
In its capacity as a coordinating agency the Council has been able to assist in arranging a very comprehensive survey of the needs of the live poultry trade in New York City under an arrangement by which the poultry interests are financing the collection of data; the United States Department of Agriculture is undertaking the analysis of the problems of inspection, price reporting, grade establishment, trading mechanism and price factors; and the Port of New York Authority is advising on terminal facilities. One of the practical accomplishments of this program has been the inauguration, on November 15, 1926, of a comprehensive commercial and health inspection of live poultry entering the City. This inspection is under the direction of the United States Department of Agricul-

HOW PRINCIPAL PORTS RANK IN DIVERSIFICATION OF EXPORT TONNAGES



New York's export supremacy is solidly based upon a wide diversity of commodities in contrast to the ports whose export tonnages are made up largely of one commodity.

EXPORT TONNAGE THROUGH PRINCIPAL U. S. PORTS



New York ships abroad nearly 12,000,000 tons of freight, or more than the combined export tonnage of the three next largest ports.

ture, and the New York City Department of Health has assisted by ruling that all poultry for sale in the City must be inspected. The remainder of the program is being pushed rapidly.

Statistical Records

In analyzing the many problems in port development presented to the staff a considerable mass of statistical material has to be gathered. Ordinarily these records cover only selected periods for which studies are made. Some of these statistics cover traffic volumes over a period of years for general freight movement to and from Manhattan pier stations, waterfront stations in other boroughs, and stations in Staten Island, and for special commodity movement of perishable foodstuffs, grain, and coal, and for export and coastwise freight.

In order to keep the members of the staff abreast of current trends in the total traffic through the Port of New York as contrasted with other ports and the growth and distribution of the traffic for particular sections and particular commodities, an effort is being made to keep these records up-to-date. The United States Shipping Board and the United States Engineers have been particularly helpful in this regard by adopting the Port of New York district as a territorial unit for compilation of export, import, and coastwise statistics.

To secure an adequate picture of the status of the Port of New York with respect to trans-shipment to and from steamship, a preliminary analysis has been made of the tonnage figures collected over the last five years by the United States Shipping Board and the dollar value figures collected by the United States Department of Commerce over a much longer period. The accompanying charts tell the story of the course of foreign trade through the Port of New York. While steadily increasing in value, this trade has not advanced quite as rapidly as the foreign commerce of the United States as a whole.

During the period 1893 to 1897, New York handled more than 50 per cent, measured in dollar value, of the foreign commerce of the United States. For the period 1898 to 1902, this share had declined to 47 per cent, and for the recent period 1921 to 1925, New York averaged about 42 per cent of the total. This decline is characteristic for Atlantic ports as a whole, due to the recent increase in traffic via the Gulf, Pacific, and Lake ports.

New York appears to be maintaining its share of the total exports of the United States, there having been but slight change over a long period of years, except for a temporary increase during the war. In absolute figures the export tonnage of New York far outstrips that of any other United States port, reaching nearly 12,000,000 tons in 1925, more than the combined tonnage of the three next most important ports. Import traffic appears to be gaining more rapidly at the outports. During the period centering about 1895, New York handled approximately 64 per cent, in dollar value, of the imports of the country. In the period centering on 1900, the percentage was approximately the same, but since then the proportion has declined to approximately 50 per cent. The largest gains at other ports are in raw materials such as silk, grain and petroleum, the manufactures of which help to swell the New York export trade.

A more complete analysis of the exports shows that the traffic at New York and Boston is diversified in character, being well distributed among petroleum, grain, foodstuffs, steel, cotton and miscellaneous manufactured products, in contrast to certain specialized ports, such as Norfolk and Newport News, where 85 to 90 per cent of the tonnage is coal, and Los Angeles, where 95 per cent is petroleum. In value per ton, as of 1925, New York, with an average of \$150.00, ranked midway between such extremes as Savannah with \$328.00 per ton, largely cotton, and Norfolk with \$45.00 per ton, largely coal. Detailed studies of the flow of traffic will be continued to aid the staff in arriving

at decisions as to the future development of the port and in protecting the interests of the port in matters involving rate adjustments.

Tax Legislation

The Legal Department has cooperated with the Commissions appointed by the two States to investigate the feasibility of providing for payments in lieu of taxes by the Port Authority upon property which would be taxable in the hands of private persons or corporations, and has assisted in drafting bills for the purpose of putting into effect the recommendations of the commissions.

New York City Cooperation

Owing to the interest which Mayor James J. Walker, of the City of New York, and President Joseph V. McKee, of the Board of Aldermen of that City, have evinced in the Port Authority as an agency for the promotion of the public interest, a solid basis for cooperation between the municipality and this body was laid during December. The appointment of a Committee of the Board of Estimate and Apportionment, consisting of the President of the Board of Aldermen, the Comptroller of the City and the President of the Borough of Manhattan, authorized to confer with representatives of the Port Authority upon matters of mutual concern furnished the basis. The questions to be discussed with this Committee include matters relating to the four interstate bridges and many other subjects.

Legislation to be enacted in New Jersey

In our Annual Report for 1926 we said:

Article XIX of the Port Compact or Treaty provides as follows:

“The two states shall provide penalties for violations of any order, rule or regulation of the port authority, and for the manner of enforcing the same.”

New York State has complied with this Article. Chapter 623 of the Laws of New York, 1924, provides methods of enforcing the orders of the Port Authority by the courts of the State and gives to the Port Authority the power of subpoena, enforceable in the courts. In the Port Compact, each state, of course, preserved its own sovereign jurisdiction and the right to select the courts which were to aid the Port Authority and to determine the basis upon which such jurisdiction was to be exercised. Article XX provides:

“The territorial or boundary lines established by the agreement of eighteen hundred and thirty-four, or the *jurisdiction of the two states established thereby*, shall not be changed except as herein specifically modified.”

Notwithstanding this clear separation of the powers of the States, the New York Central Railroad has taken the position that Chapter 623 of the Laws of New York, 1924, is not in effect because it has not been concurred in by New Jersey. In a brief submitted to the Joint Grade Crossing Committee of the New York Legislature it argues:

“The act of the State of New York of May 5, 1924 (chapter 623 of the laws of the State of New York of 1924), purporting to make the Port of New York Authority an administrative body, is not in effect.

“On May 5, 1924, the State of New York amended its Act of February 24, 1922, by which former act, as therein stated, ‘The State of New York agrees with the State of New Jersey upon the comprehensive plan for the development of the Port of New York pursuant to the compact authorized by the two states and signed April 30, 1921, and consented to and approved by Congress,’ etc. This amendatory Act purported to enlarge the powers of the Port Authority by making it, in certain respects, an administrative body authorized to hold hearings, subpoena witnesses and enter orders in respect of the comprehensive plan.

"The State of New Jersey failed to enact similar legislation.

"Article III of the compact between the two states enacted by their respective legislatures, which is the charter of the Port Authority, provides that it 'shall be a body corporate and politic having the powers and jurisdiction hereinafter enumerated *and such other additional powers as shall be conferred upon it by the Legislature of either state concurred in by the Legislature of the other, or by act or acts of Congress, as hereinafter provided.*' (Italics ours.)

"Article VII contains the same limitations with respect to conferring additional powers.

"The compact thus entered into required as hereinbefore shown, the consent of Congress and, as heretofore said, the consent so given by the Congressional Joint Resolution of August 23, 1921, was 'to the said agreement, and to each and every part and article thereof.' The subsequent acts of the two legislatures agreeing upon the comprehensive plan were likewise a compact requiring for their validity the consent of Congress, which was duly given by Joint Resolution approved July 1, 1922.

"It thus appears that the parties to the compact (the two states) have agreed, and Congress has so sanctioned, that the powers of the Port Authority shall not be enlarged without their concurrence. It follows from the provisions of Article III of the compact, above quoted, that the Act of the State of New York of May 5, 1924, is in abeyance unless and until it shall have been concurred in by the Legislature of the State of New Jersey and approved by Congress. This is so clear as not to call for extended comment."

In proceedings brought before the Public Service Commission in New York to carry into effect an order made by the Port Authority in regard to the use of the Hell Gate Bridge, the New York Central Railroad takes the position that the Port Authority's order is without any legal authority.

While the Commissioners do not agree with this view, it is desirable to clear up the point. That the State of New Jersey should give the Port Authority similar powers

in New Jersey seems to us to require no extensive argument. In our report for 1925 we said:

“The Legislature of New Jersey is requested to complement the act of New York in order that the Port Authority may not be left to such voluntary information as the carriers in the jurisdiction of New Jersey may choose to give, or to such proceedings as it may institute before the Interstate Commerce Commission.

“Without this power of investigation in New Jersey, the Port Authority will be hampered in its work of securing the essential facts necessary in building up the proof that any step for effectuating the Comprehensive Plan is ‘economically practicable.’ Under the Constitution, this can only be done after public hearing and the receipt of evidence. To make such determination without the power of subpoena, as in the case of Belt Line No. 13, up to the point where the carriers submitted their cases, resulted in costs to the two states in the proceedings alone, of more than \$50,000. The basic data had to be secured from the books of the carriers themselves, and but for the cooperation of the carriers and the interposition of the Interstate Commerce Commission when one carrier consistently refused to give the Port Authority any information, this would have been impossible. The law now on the Statute Books of New York is modeled after the Public Service Commission Law in New York, the Interstate Commerce Act, and the general procedural provisions of all similar statutes.

“The New York Statute includes the power to apply to the Courts for injunction or mandamus. This power the Port Authority already possesses, but it should be explicitly stated in the act.

“In order to avoid litigation, these processes of law are necessary, not for the purpose of compelling all the carriers to comply with the provisions of the Comprehensive Plan, but in order that those who are already cooperating shall be encouraged by the knowledge that those who might not be inclined so to do can be brought to agreement by process of law.”

Pursuant to this recommendation a bill was prepared by our counsel following the lines of Chapter 623 of the Laws

of New York for 1924 and was introduced in the Assembly by Hon. Thomas L. Hanson (Assembly, No. 183). The bill was not passed.

We repeat our recommendation of last year and urge the enactment of this legislation.

We also call to the attention of the New Jersey Legislature, the advisability and desirability of legislation which will permit the Port Authority to enter immediately upon property which is involved in condemnation proceedings. New York has made such provision in her laws, New Jersey has not. The advantage of such legislation is obvious. All property taken by the Port Authority is for the public benefit. Where the Port Authority and the owner of real estate cannot agree upon a price condemnation is necessary and to delay entrance upon the property until the proceedings have been concluded may mean a serious interruption of construction work resulting both in a higher cost and a serious inconvenience to the public. The private owner is perfectly protected under condemnation and can suffer no loss if his property is entered upon immediately after the institution of such proceedings.

Reorganization of the Port Authority Staff

The broadening scope of the work of the Port Authority under the Comprehensive Plan, and particularly the taking up of the physical construction and the fiscal problems of the bridges, authorized by the two states, required reorganization of the staff during the year 1926, as has been indicated.

Mr. John E. Ramsey, who had given exceptional service as the Chief of the Bureau of Statistics and Accounts for several years, was made Chief Executive Officer of the Port Authority and given charge of all of its business activities.

A Bridge Division was created with Mr. O. H. Ammann as Bridge Engineer and Prof. Wm. H. Burr, Professor Emeritus of Columbia University and Dr. J. A. L. Waddell as Bridge Consulting Engineers. Mr. Cass Gilbert was

engaged to supply architectural treatment for the Hudson River Bridge and the firm of York & Sawyer to render similar services for the Arthur Kill Bridges.

Mr. Billings Wilson was made Deputy Manager and placed in charge of the Division of Port Development, having to do with the activities of the Port Authority under the Comprehensive Plan. Mr. W. W. Drinker was appointed Chief Consulting Engineer, and General George W. Goethals continued as Consulting Engineer. A Finance Department was created with Mr. William Leary, heretofore Secretary of the Port Authority as Treasurer, Mr. Davis L. Waters as Assistant Treasurer and Mr. Marion Rodgers as Auditor. Mr. Wilson J. Vance, Assistant Secretary was made Secretary.

The Legal Department was augmented in order that such matters as bond issues, contracts, purchases of lands, condemnation proceedings, and the like might receive instant and adequate attention. Mr. Julius Henry Cohen continued as Counsel to the Port Authority and there were added to the Legal Staff Mr. Leander I. Shelley, in charge of contracts and similar matters, Mr. Charles Horowitz, in charge of litigation, and Mr. J. S. Dudley, in charge of real estate. A real estate and title department was also instituted, which has cooperated closely with the legal staff.

EXPENDITURES ON APPROPRIATIONS MADE BY THE STATES OF NEW JERSEY AND NEW YORK FOR EFFECTUATION OF THE COMPREHENSIVE PLAN AND FOR PRELIMINARY SURVEYS FOR BRIDGES OVER THE HUDSON RIVER, ARTHUR KILLS AND THE KILL VON KULL

Fiscal Year Ended June 30, 1926

	Compre- hensive plan	Preliminary bridge surveys	Total
ADMINISTRATIVE DEPARTMENT:			
Services and expenses—administrative staff.....	\$12,042 57	\$10,637 15	\$22,679 72
Services and expenses of clerks and stenographers.....	8,360 90	9,101 68	17,462 58
Office rent.....	11,098 10	10,371 85	21,469 95
Office expenses, supplies and equipment	16,424 75	7,063 99	23,488 74
Stationery and printing.....	9,052 96	3,848 84	12,901 80
	\$56,979 28	\$41,023 51	\$98,002 79
LEGAL DEPARTMENT:			
Services and expenses—special counsel	\$15,758 71	\$5,000 00	\$20,758 71
Services and expenses—legal staff....	14,393 32	9,099 63	23,492 95
	\$30,152 03	\$14,099 63	\$44,251 66
ENGINEERING DEPARTMENT:			
Services and expenses—engineering staff.....	\$25,983 75	\$121,425 38	\$147,409 13
Services and expenses—statistical staff	94,108 01	63,491 33	157,599 34
	\$120,091 76	\$184,916 71	\$305,008 47
Total expenditures.....	\$207,223 07	\$240,039 85	\$447,262 92

PART TWO

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**ANNUAL REPORT OF THE PORT OF NEW YORK
AUTHORITY FOR THE CALENDAR YEAR 1926**

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RELATING TO BRIDGES

PART TWO

ANNUAL REPORT OF THE PORT OF NEW YORK AUTHORITY FOR THE CALENDAR YEAR 1926

RELATING TO BRIDGES

Interstate Bridges of the Port Authority

By the direction of the legislatures of the two states, the Port Authority is engaged in four bridge enterprises.

Two of these structures, the Outerbridge Crossing which is the name officially given to the bridge from Perth Amboy, New Jersey to Tottenville, Staten Island, New York, and the bridge from Elizabeth, New Jersey to Howland Hook, Staten Island, New York will span the Arthur Kill at strategic points. These structures have been fully financed and the contracts let for the major part of the work upon each. Construction was actually begun in the latter part of 1926 and the progress made has met all expectations.

The Hudson River Bridge will span the stream by whose name it is known, from Washington Heights in the Borough of Manhattan, City of New York, to a point opposite in the Borough of Fort Lee, N. J. Financing for the initial stage of construction has been accomplished and as soon as specifications can be prepared bids for the substructure will be invited.

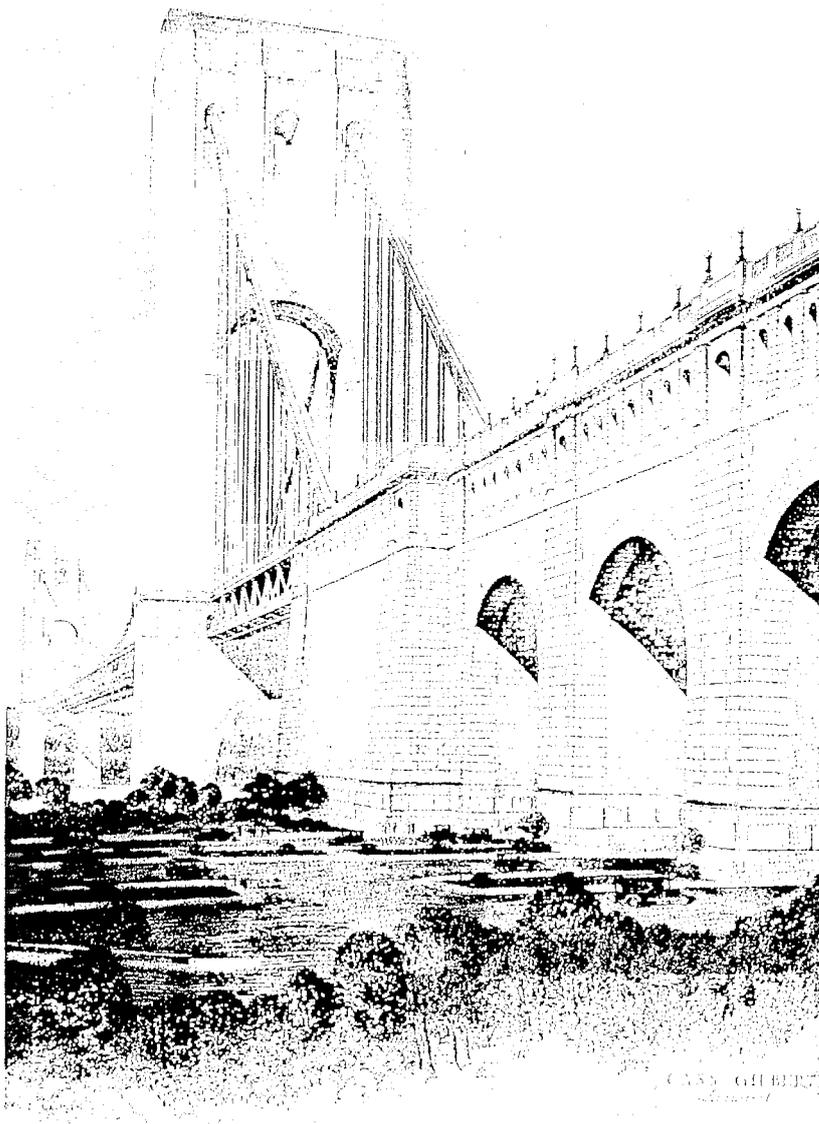
The fourth bridge will cross the Kill van Kull affording a direct connection between Bayonne, New Jersey and Port Richmond, Staten Island, New York. The engineering studies for this structure will, it is expected, be completed shortly, when a report will be issued giving in full detail the plans and estimates.

Bridges Over the Arthur Kill

Staten Island, which, as the Borough of Richmond, is one of the subdivisions of the City of New York, is separated from New Jersey by the Kill van Kull and the Arthur Kill. The "Kills" form one of the most important waterways within the Port of New York. They range in width from a few hundred feet to almost 2,000 feet. They are, taken together, about 12 miles in length. They connect Upper New York Bay with Newark Bay and Raritan Bay and through the latter with the Lower New York Bay. Their depth has always been sufficient to permit their navigation by craft of fair size and within recent years the channels have been improved so that they now can accommodate deep-draught vessels. Because of their sheltered situation the Kill van Kull and the Arthur Kill can be navigated with safety even when severe storms prevail. The commerce borne upon the Kills is very heavy. In particular several of the railroads employ the Kills for the transportation of coal in scows or barges under tow to yards in Greater New York.

Ferry service, established before the days of steam, stimulated trade and commerce between New Jersey and Staten Island. Agitation for a bridge or bridges to connect the Island with the New Jersey main land began almost a century ago. In recent years the demand became intensified because of the growth of use of the automobile for business and pleasure purposes which put a tax upon the capacity of the limited ferry facilities beyond their power to meet.

Surveys made from time to time for the purpose of determining where bridges might be placed advantageously, served to maintain and stimulate interest, but the invisible state line between New Jersey and Staten Island proved a barrier against construction until recently. In 1924 the legislatures of New York and New Jersey solved the problem by directing the Port Authority, a bi-state body acting as the agent of both sovereignties to construct, operate and maintain bridges across the Arthur Kill from Perth



Hudson River Bridge, with viaduct approach, New York side.

Amboy, N. J. to Tottenville, Staten Island in the one instance and from Howland Hook, Staten Island to Elizabeth, N. J., in the other, and made appropriations to pay the cost of studies for the structures.

These studies included consideration of the best points where bridges might be placed, estimates of the traffic which might be expected to use the structures and the revenues to be derived therefrom, the type of the bridges themselves, their clearances above the water, estimates of cost and plans more or less in detail. On January 6, 1925, public hearings were held on the plans for the two structures by the Port Authority, and in February of that year a preliminary report was presented to the legislatures embodying results of all studies, conferences and hearings.

With changes of minor import the plans for the two structures described in this report have been adhered to. Each bridge is designed to accommodate highway traffic only, carrying on a single deck, a four-lane vehicular roadway and two 5-foot sidewalks. The maximum roadway grade is four per cent. Plazas of ample size, with toll booths are provided for at each end. The demand for beauty as well as utility in the structures led the Port Authority to engage Messrs. York & Sawyer, a noted firm of architects to render architectural service in cooperation with the engineers.

The Outerbridge Crossing

The bridge from Perth Amboy to Tottenville which was named "The Outerbridge Crossing," in honor of Eugenius H. Outerbridge, the first chairman of the Port Authority, will extend from Francis street in Perth Amboy to a point 1,400 feet east of Arthur Kill road in Tottenville, a total length of about 10,200 feet. The Arthur Kill is crossed by a high-level cantilever bridge 1,500 feet long with a central span of 750 feet and a clear height above water of 135 feet. The cantilever is flanked by two 300-foot through truss spans. The steel trusses of the main river bridge are to be supported by arched concrete piers and the pier bases

are to rest on timber piles. The approaches will consist of plate girder spans supported by arched concrete piers, resting partly on timber piles, partly on reinforced concrete piles, and partly on spread footings. For a great part of the way the approaches will rest on firm soil close to the surface. The cost of the Outerbridge Crossing it is estimated will be approximately \$10,000,000.

Elizabeth-Howland Hook Bridge

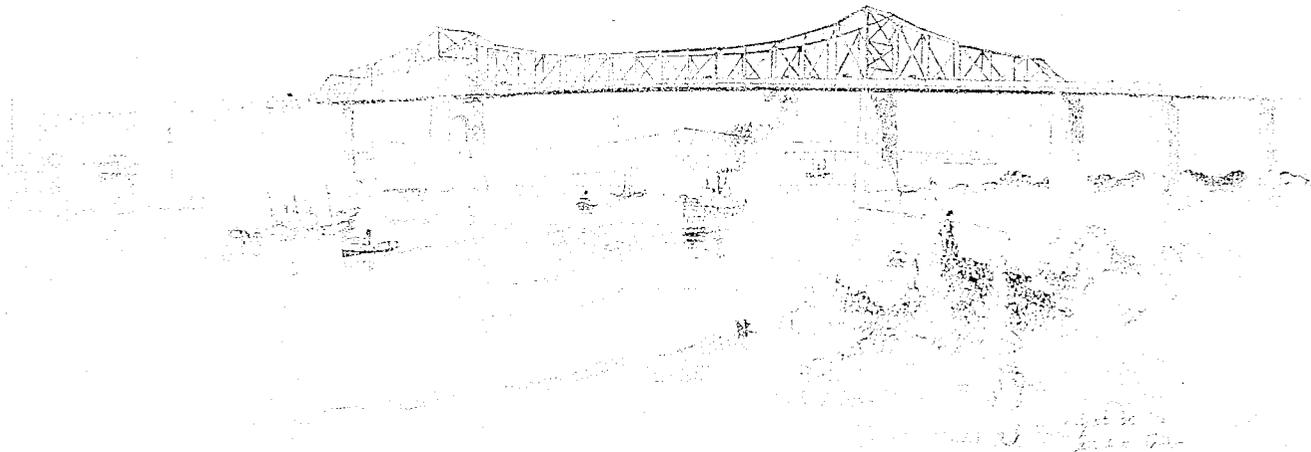
The Elizabeth-Howland Hook Bridge will extend from Edith Avenue in Elizabeth to McKinley Avenue in Howland Hook, a total length of about 8,500 feet. The bridge proper will be a high level truss structure 1,152 feet long with a center span of 672 feet and a clear height of 135 feet. The central span is sufficient in length to clear the whole width of the stream.

The approaches will consist of plate girder spans and all spans will be supported by arched concrete piers of similar design to those employed in the construction of the Outerbridge Crossing. Bedrock in this vicinity is close to the surface and all the piers of the main river bridge will be carried thereto. The cost of the Elizabeth-Howland Hook bridge is estimated at \$6,583,800.

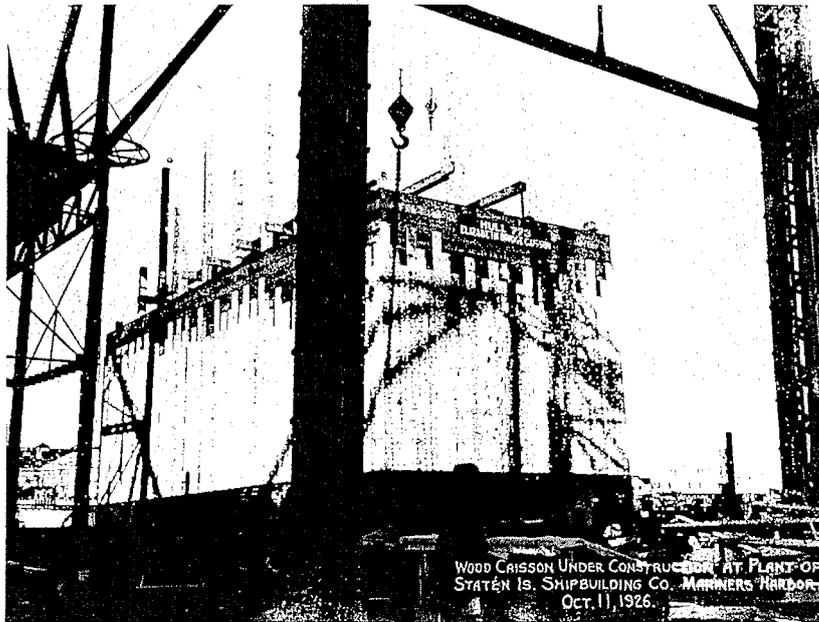
Application was duly made to the War Department for permission to construct the bridges and on July 29, 1925, Colonel Herbert Deakyne, the District Engineer, U. S. A., conducted a hearing in the offices of the Port Authority, which was largely attended. A formal permit for the construction of the bridges was issued by the War Department in November, 1925.

Financing the Arthur Kill Bridges

With the settlement of the character and location of the bridges the problem of financing them naturally presented itself for solution. The legislatures of the two states at the 1925 session passed laws of identical effect providing for advances to the Port Authority aggregating \$4,000,000, in aid of the construction of the bridges. Each state under



Elizabeth-Howland Hook Bridge.



Caisson used in construction of Elizabeth-Howland Hook Bridge.



Steel reenforcing mat for pier base, Tottenville.

these laws agreed to advance half or \$2,000,000 to the Port Authority, in equal annual installments over a period of five years. It was provided also that the bonds, or other securities which the Port Authority should sell, would have the first lien upon the revenues of the two bridges and that while the advances by the legislatures would have to be repaid the liens of the states would be second to that of the bond holders.

Traffic estimates

Elaborate calculations as to the amount of traffic which would use the two bridges and pay tolls therefor had been made by the Port Authority engineers. These calculations took in not merely the traffic using the ferries from New Jersey to Staten Island but also that which would be naturally diverted to the new structures although all figures for safety's sake were placed on an exceedingly conservative basis. The estimates of traffic for the Outerbridge Crossing were as follows:

<i>Year</i>	<i>Vehicles</i>	<i>Passengers in vehicles</i>	<i>Pedestrians</i>
1928.....	1,058,600	3,261,000	2,958,000
1929.....	1,257,000	3,872,000	3,230,000
1930.....	1,492,700	4,598,000	3,528,000
1931.....	1,738,700	5,355,000	3,853,000
1932.....	1,994,000	6,142,000	4,208,000
1933.....	2,186,800	6,736,000	4,524,000
1934.....	2,392,600	7,369,000	4,840,000
1935.....	2,613,400	8,051,000	5,157,000
1936.....	2,705,400	8,332,600	5,338,000
1937.....	2,800,100	8,624,000	5,524,000
1938.....	2,898,000	8,926,000	5,718,000
1939.....	3,000,000	9,239,000	5,918,000
1940.....	3,104,400	9,562,000	6,125,000

The estimates for the Elizabeth-Howland Hook Bridge were as follows:

<i>Year</i>	<i>Vehicles</i>	<i>Passengers in vehicles</i>	<i>Pedestrians</i>
1928.....	897,700	2,361,000	2,074,000
1929.....	1,100,000	2,892,000	2,224,000
1930.....	1,347,000	3,544,000	2,383,000
1931.....	1,638,000	4,307,000	2,556,000
1932.....	1,936,000	5,092,000	2,739,000
1933.....	2,118,000	5,570,000	2,944,000
1934.....	2,311,500	6,079,000	3,151,000

Year	Vehicles	Passengers in vehicles	Pedestrians
1935.....	2,518,000	6,623,000	3,355,000
1936.....	2,606,000	6,855,000	3,472,000
1937.....	2,697,700	7,095,000	3,594,000
1938.....	2,792,000	7,343,000	3,720,000
1939.....	2,890,000	7,600,000	3,850,000
1940.....	2,991,000	7,866,000	3,985,000

Estimates of revenue

Equally careful estimates were made as to the income which would be derived through tolls from the expected traffic after maintenance and operating expenses had been deducted. The table for the Outerbridge Crossing on a 60c vehicle tariff presented the following figures:

60 Cent Vehicle Tariff

Year	Revenue	Income	Return
1928.....	\$857,400	\$743,900	7.35%
1929.....	1,012,300	898,800	8.88%
1930.....	1,196,100	1,082,600	10.70%
1931.....	1,388,000	1,250,500	12.35%
1932.....	1,587,700	1,450,200	14.32%
1933.....	1,739,400	1,601,900	15.83%
1934.....	1,900,800	1,763,300	17.41%
1935.....	2,073,700	1,936,200	19.12%
1936.....	2,146,600	2,009,100	19.85%
1937.....	2,221,800	2,084,300	20.60%
1938.....	2,299,500	2,162,000	21.36%
1939.....	2,380,000	2,242,500	22.15%
1940.....	2,463,200	2,325,700	22.98%

The estimates of revenue, income and return from the Elizabeth-Howland Hook Bridge for the same rate of toll were as follows:

Year	Revenue	Income	Return
1928.....	\$698,100	\$589,600	8.96%
1929.....	848,700	740,200	11.24%
1930.....	1,033,400	905,000	13.75%
1931.....	1,249,100	1,120,600	17.03%
1932.....	1,470,800	1,342,400	20.38%
1933.....	1,608,300	1,479,800	22.48%
1934.....	1,753,900	1,625,400	24.68%
1935.....	1,909,200	1,780,700	27.05%
1936.....	1,976,000	1,847,600	28.07%
1937.....	2,045,100	1,916,700	29.12%
1938.....	2,116,700	1,988,300	30.19%
1939.....	2,190,800	2,062,400	31.32%
1940.....	2,267,500	2,139,000	32.49%

Sale of bridge bonds

Because of the fact that Port Authority securities unsupported by the power to tax or to assess for benefits were something of a novelty in this country, there was great interest in the first sale of its bonds in the amount of \$14,000,000 to provide the funds necessary for the construction of the two Arthur Kill Bridges. The plans of the engineers for the two bridges, the calculations of traffic experts on the amount of traffic which they would carry, the revenues that would be derived therefrom, and all other figures assembled by the staff of the Port Authority, were given the keenest scrutiny by financial concerns which specialize in governmental and municipal issues.

After consultation with a number of financial experts, the Commissioners of the Port Authority decided to issue bonds bearing a rate of interest not to exceed $4\frac{1}{2}$ per cent. The sale was held on March 4th last, and despite the fact that at that time there had been a flurry in the stock market the offer of the syndicate headed by the National City Company of New York of 97.25 per cent for the bonds was deemed highly satisfactory and the award was made accordingly. The bonds were issued to mature serially in amounts ranging from \$300,000 on March 1, 1932, to \$1,500,000 on March 1, 1946, and were callable after March 1, 1936 at 105. The bid of the successful syndicate represented a net payment to the Port Authority of \$13,615,000 at which the cost of the money represented the equivalent of 4.77 per cent.

The public demand for the bonds resulted in an over-subscription and within twenty-four hours they were quoted in the money market at from $100\frac{1}{4}$ to $101\frac{1}{2}$, depending upon the maturing date and the securities have been held at a premium ever since.

Contracts awarded

Contract drawings, estimates and specifications were prepared during the spring and early summer. Bids were received for the substructures of both bridges, covering approaches and river crossings, on July 21st and on Au-

gust 24th bids were received for the steel superstructures. Awards were made as follows:

Outerbridge Crossing: Sub-structure:

Perth Amboy side.....Cornell Contracting Corporation.

Tottenville side.....Including foundations in Arthur Kill, Frederick Snare Corporation.

Superstructure:

Entire steel work.....McClintic Marshall Company.

Elizabeth-Howland Hook Sub-structure:

Bridge:

Elizabeth side.....Trist Contracting Corporation.

Howland Hook side....Frederick Snare Corporation.

Superstructure:

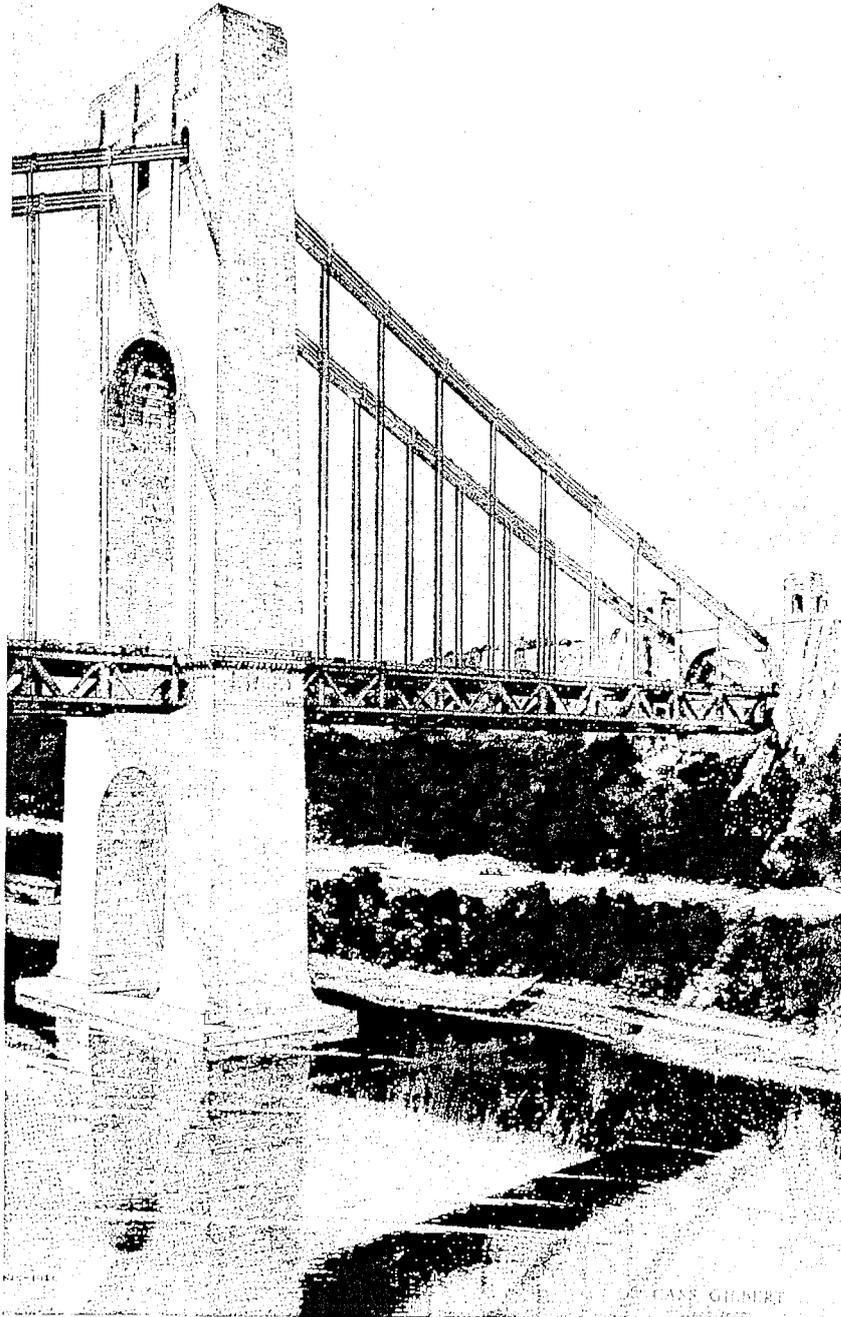
Entire steel work.....Bethlehem Steel Company.

Progress of operations

Work was begun on the four approaches; namely, Elizabeth, Howland Hook, Perth Amboy, and Tottenville. Excavations were rapidly completed, foundation piling driven and concrete poured, during October, November and December, so that at the end of the latter month the concrete shafts were, in a number of cases, above the surface of the ground. Due to the early cold weather in December, operations were seriously hampered, particularly in the placing of the concrete, but by suitable precautions, work was and is carried on favorably.

At Elizabeth, rock was encountered at the depths expected and the main pier at the west side of the waterway had reached its final depth in solid rock at the end of the year. On the Howland Hook side the pneumatic caisson having been placed in position, was rapidly going down through a mixture of clay, boulders, sand, etc. Other foundations on piling were well under way.

At Perth Amboy a number of the piers having concrete piles under them were up to the surface of the ground.



New Jersey end of Hudson River Bridge showing entrance into Palisades.

The two large piers near the water are enclosed in steel sheet piling and excavation at the year's end was going on within them. Some of the piers for the crossing over the water are enclosed in steel sheet cofferdams which had been excavated and wood piling was being driven in them at the end of the year.

On the Tottenville side the pier bases had been constructed and the shafts were above the surface of the ground. The work it is anticipated will be ready on time to receive the steel next fall.

The steel superstructure is under way at the mills and shops, a large amount having been rolled and in process of fabrication, so that deliveries will begin in ample time to begin the work of erection as soon as the concrete piers are ready to receive it.

Hudson River Bridge

The bridge which the Port Authority will construct across the Hudson River from Washington Heights, Borough of Manhattan, City of New York, to Fort Lee, Bergen County, New Jersey, means that the dream of many years and of many millions of persons will finally be realized. Even before the days of the railroads the desirability of a more intimate and direct connection than was afforded by ferry service, between New York City and that section of New Jersey immediately opposite, was appreciated. The great growth of population on both sides of the stream, the closer knitting together of trade and social ties, even the construction of the tubes for rapid transit service under the river and the decision to build the vehicular tunnel which soon will be thrown open to traffic, only served to accentuate this desire.

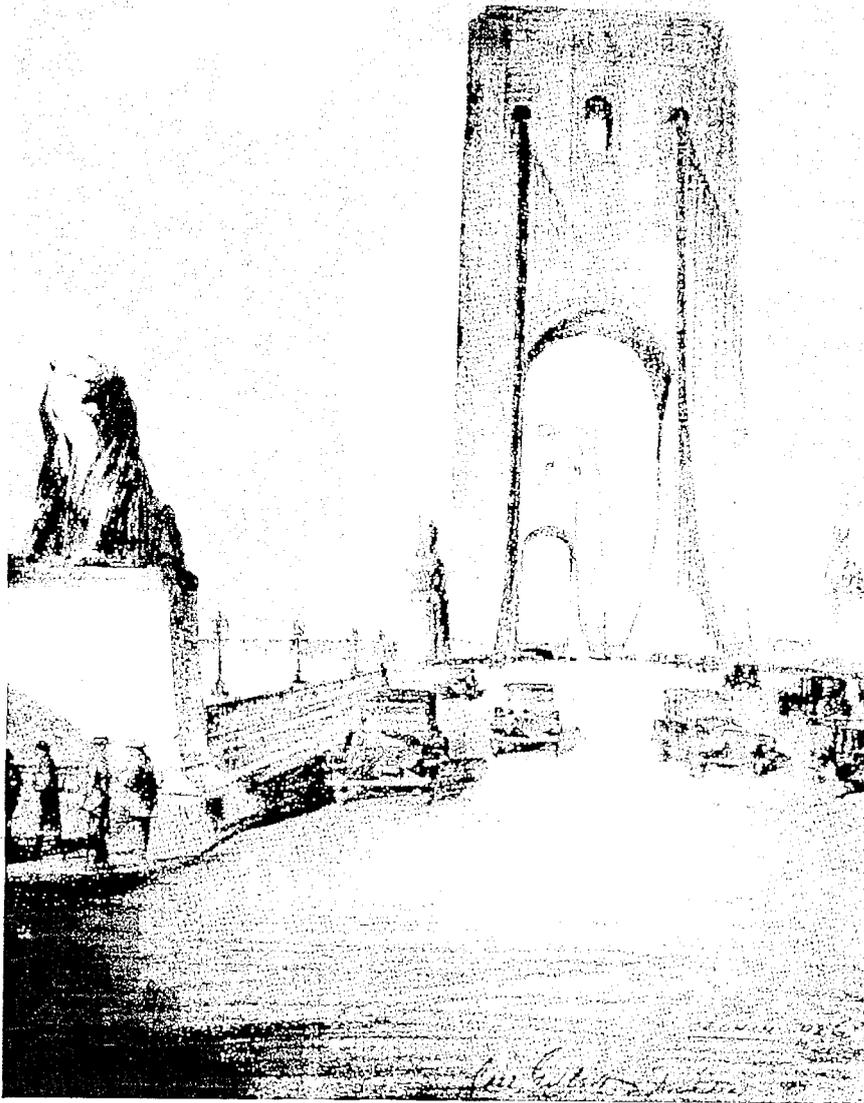
The great width and depth of the Hudson River, together with the belief that the War Department would not permit any interference with the navigation of that most important waterway which would be involved in the erection of midstream piers, seemed for a time to preclude

the construction of a bridge. Of late years, however, it has been demonstrated that suspension bridges of great length, permitting the crossing of even so wide a river as the Hudson without in any way interfering with navigation, are entirely feasible. Hence, the agitation for a Hudson River Bridge gained renewed force and took on the form of a public demand from the populations on both sides of the stream, until the demand could be no longer logically resisted. In 1925 the legislatures of the two states enacted statutes authorizing and empowering the Port of New York Authority to construct a bridge from somewhere between 170th and 185th streets in the Borough of Manhattan across the Hudson to a point approximately opposite in the Borough of Fort Lee.

In 1926 each legislature undertook to advance to the Port Authority in aid of the construction of the bridge, in equal annual installments the sum of \$5,000,000, making a total sum of \$10,000,000 available from the two sovereignties. Each state also appropriated \$150,000 for study purposes, the total being \$300,000. The study necessarily involved an extended period of time, together with unusually elaborate calculations and designs. In February, 1926, however, a tentative report was made by the Bridge Engineer, Mr. O. H. Ammann, pointing out an economical and feasible location for a bridge and indicating that a structure of the suspension type with a single span across the entire width of the waterway with adequate approaches, could be constructed for something in the neighborhood of \$50,000,000. Since that time the preliminary designs have been thoroughly revised, preliminary calculations as to possible traffic and revenue have been verified and a wealth of data collected.

Site of the bridge

The general site selected for the Hudson River Bridge is replete with and indeed exceptional in natural charm. On the New Jersey side rising from near the water's edge are the Palisades, presenting the appearance of battlements,



Suggested treatment, New York entrance, Hudson River Bridge.

and extending in either direction for miles. On the New York side Fort Washington Park with its greensward, trees and massive boulders presents an attractive setting for the many handsome buildings which rear themselves on Washington Heights to the East. Between, rolls the Hudson in full power and majesty.

There is also the attraction of historical atmosphere. Fort Washington and Fort Lee both guarded the river against the approach of British war ships in the early days of the Revolution when Washington was seeking to maintain a foothold on Manhattan Island. In November of 1776, after Washington's retirement to Westchester County, Fort Washington continued to offer resistance to the British and was only captured by overwhelming forces after a gallant struggle. Fort Lee held a considerable American garrison for those days, and a movement in force by the British was necessary before its defenders retired.

Suspension span of 3,500 feet

The bridge which is to be constructed in this beautiful and historical region will have a main suspension span of 3,500 feet, the entire width of the river. On the New York side the main pier or tower will be located on land, the foundation being carried to solid rock. On the New Jersey side the pier will be located within the War Department's pierhead line with foundations reaching to a solid bed of rock in the neighborhood of 100 feet below the water level. The top of the rocky cliff of the Palisades forms a natural abutment and offers a solid anchorage for the cables of a suspension bridge on the New Jersey side. On the New York side the anchorage will be found in an enormous mass of concrete, suitably faced with granite for monumental effect. The side spans on either side will be of the same length, approximately 650 feet. Thus, the total length of the bridge proper between abutments or anchorages becomes 4,800 feet.

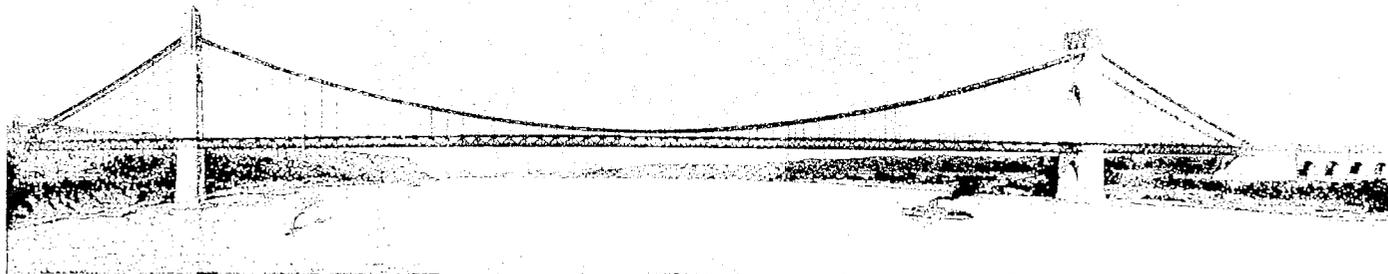
Each of the great piers or towers will rise 650 feet above the ground level. The elevation of the bridge floor as determined by the height of the connecting streets on both

sides of the river will be 240 feet above water level. This will leave a clear height of 195 feet above mean high water at both towers and 206 feet at the center of the bridge under normal temperature and without load. With a combination of high temperature and full load, a condition not likely ever to occur, the floor would sag to 196 feet in the clear at the center.

It is interesting to compare the clearance of this bridge with other structures spanning waterways which are used by large ocean-going vessels. The East River bridges in New York have a clear height of 135 feet for a width of channel of 400 feet, decreasing to from 114 to 126 feet at the pierhead lines. The recently completed Delaware River Bridge between Philadelphia and Camden provides for 135 feet clear height for a width of 800 feet. The St. Lawrence River Bridge at Quebec has a clearance of 150 feet for a width of 600 feet and the bridge at the entrance to Sydney Harbor, Australia, which is now under construction, will have 175 feet for a width of 600 feet. Thus the Hudson River Bridge will provide for the entire width between pierhead lines, about 3,200 feet, a clear height 60 feet greater than that of the East River Bridge, and 25 feet greater than that under the next highest bridge over any waterway admitting passage of the large ocean vessels.

Ample clearance for big ships

The bridge has ample height for the passage of the largest vessels which are likely to seek to go up the river beyond this location. Unquestionably this circumstance is reflected in the prompt approval by the War Department of the application for the permit to construct the bridge. The suspension span of the Hudson River Bridge will be just exactly twice the length of the longest span now in existence which is that of the Delaware River Bridge at Camden. A comparison in other respects with this bridge and with the Brooklyn Bridge across the East River, which a generation ago was considered one of the marvels of bridge construction is interesting. The following table affords this comparison:



Profile Hudson River Bridge.

	<i>Hudson River bridge</i>	<i>Delaware River bridge</i>	<i>Brooklyn bridge</i>
Length of river span.....	3,500 ft.	1,750 ft.	1,595 ft.
Length of side span.....	650 ft.	752 ft.	930 ft.
Total length between anchor- ages	4,800 ft.	3,253 ft.	3,455 ft.
Total length of bridge and ap- proaches (between plazas).	7,800 ft.	8,240 ft.	6,016 ft.
Clear height above water....	200 ft.	135 ft.	135 ft.
Height of towers above water.	650 ft.	375 ft.	275 ft.
Width of bridge floor (above all)	125 ft.	125 ft.	86 ft.
Traffic capacity:			
Sidewalks	2	2	1
Roadway lanes	8	6	4
Electric railway tracks....	4	4	2
	14	12	7
Weight of suspended structure	120,000 tons	40,000 tons	16,000 tons
Strength of carrying cables..	330,000 tons	125,000 tons	45,000 tons

Safety of suspension type

Because of the other unprecedented proportions of the Hudson River Bridge and more particularly because of the length of the great span, a natural question has arisen in the minds of laymen as to the stability of the structure. There need be no fears on this subject. The best bridge engineers have been engaged and consulted and see no difficulty whatever.

Engineers familiar with the design and construction of large bridges have pointed out from time to time that the feasibility of building a bridge of as long a span as 3,500 feet and more is essentially a question of economy, and that the span length and size of a bridge have nothing whatsoever to do with its safety either during erection or after completion.

The feasible limit of span is reached when the amount of metal required to carry a given load becomes excessive in cost and not because the safety is impaired. The physical limit of span is reached when no amount of metal can safely carry more than its own weight. The latter limit can be mathematically determined for the safe strength of any given material, and has been calculated by various authorities at 10,000 feet and more.

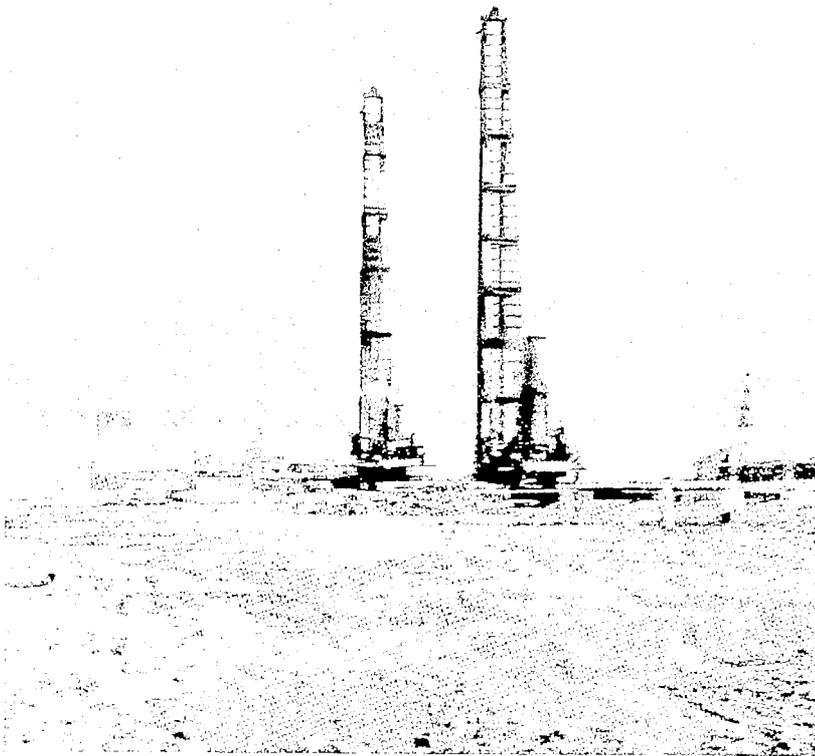
Suspension bridges of widely different type, proportions and appearance may be and have been designed and built.

In the conception and development of the design of the proposed bridge the guiding motives, from an engineering point of view, have been purity of type, simplicity and determinateness of structural arrangement, and ease and expediency of construction, these motives being compatible with true economy, greatest safety and utility and with good appearance. The principal elements of the structure and their functions are simple and clearly defined. The straight, or slightly cambered, floor is suspended vertically from two cables throughout its length, and without the uncertain restraint exerted by rigid stiffening trusses or by suspension from more than two cables. The cables pass over the towers and hang free in their natural graceful catenary, unencumbered by a network of bracing, and are securely anchored at their ends to the solid mass of bedrock on the one side and to a massive block of masonry, founded on rock, on the other. The towers which support the cables vertically, deliver their enormous load to foundations on solid bedrock. The arrangement is one of exceptional freedom from complicated and uncertain stress action.

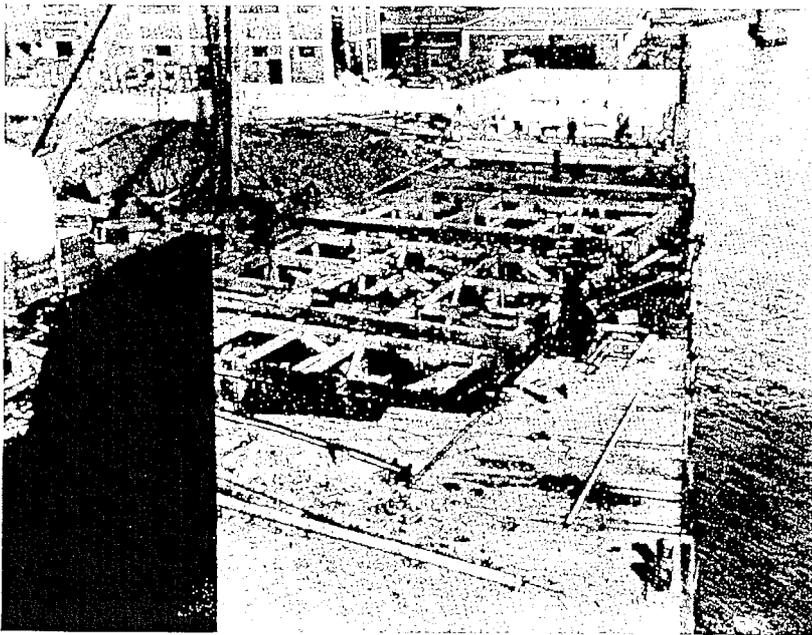
Enlargement made possible

A further important aim in the development of the design has been to permit the later enlargement, or increase in capacity, of the bridge and its approaches after its initial opening to traffic; in a bridge of this size, such an arrangement is of considerable economic advantage. It permits the opening of the bridge to traffic years in advance of the final completion, it effects a large saving in initial cost and in interest during construction and after completion, and, finally, allows greater flexibility in the accommodation of traffic to suit changing conditions.

In attacking the problem of designing this bridge, it was also realized that more than usual attention must be paid to the aesthetic side, not only because of the monumental size and conspicuous location of the bridge in the midst of a charming landscape, but because the bridge must be built



Driving sheet piling around crib at Perth Amboy end, Outerbridge Crossing.



Cofferdam at Elizabeth approach, bridge to Howland Hook.

to last for generations and must be handed down to posterity, not only as an engineering achievement but as a truly monumental structure, which will cast credit upon the aesthetic sense of the present generation. While the general outlines and proportions were dictated by engineering requirements, certain parts as towers, anchorages and approaches called for careful architectural treatment to lend them dignified appearance. This was supplied by Mr. Cass Gilbert, the distinguished architect.

Gives an unobstructed view

A notable and highly desirable feature of the proposed design, not common in large bridges, is that it permits practically unobstructed view from the roadway deck sideways and overhead, no trusswork or bracing whatsoever extending above the floor. This also permits free circulation of air at the roadway and thus adds to the pleasure and comfort of riding over the bridge.

The floor structure is arranged with two decks of which the upper one is to serve vehicular and pedestrian traffic exclusively and the lower one is reserved for passenger traffic.

The floor structure is simple and determinate. The floor-beams, which carry the longitudinal floor-stringers, are rigid frames whose vertical extensions carry the tracks on the lower floor in cantilever fashion.

The upper floor is divided into two outside roadways, each 24 feet wide, a central roadway 40 feet wide and two 6-foot sidewalks. The central roadway will accommodate four lanes of traffic and each of the outside roadways will conveniently accommodate two lanes and in an emergency, or intermittently, three passenger cars side by side. The central roadway and the footwalks are to constitute the initial capacity of the bridge. The traffic studies indicate that they will be sufficient to meet the traffic demand for at least five, possibly ten, years after the opening of the bridge, since they will be capable of accommodating conveniently a yearly traffic of at least twelve million vehicles.

The outside roadways are to be erected later and will practically double the initial capacity for vehicular traffic. They will probably be required by 1938.

Although their theoretical capacity is over 30 million vehicles annually, it is not expected that the three roadways should normally carry a traffic in excess of about 16 million vehicles, inasmuch as a heavier traffic concentrated at any one crossing may cause excessive congestion in the connecting streets. It is assumed that by the time such a volume of traffic is attained, other crossings will be provided. However, a marginal capacity on the bridge is advisable and it is also desirable, for the safety and convenience of the traffic, coupled with greater speed, to segregate as far as practicable east and westbound traffic, as well as slow service vehicles and fast moving passenger automobiles. It is therefore assumed that the outside roadways will eventually serve as speedways for one-way automobile traffic and the central roadway for slow mixed traffic.

The lower deck is designed to accommodate up to four electric railway tracks or equivalent lanes of bus passenger traffic. It is to be omitted initially and erected after the opening of the bridge for initial capacity. The passenger traffic studies indicate that demand for it may arise within ten years after the opening of the bridge for vehicular traffic, and possibly earlier, and that the volume of prospective passenger traffic fully justifies the comparatively small initial expenditure of about one and one-half million dollars and the ultimate expenditure of less than ten million dollars, which is involved in provision for four rapid transit tracks on the bridge and approaches.

Towers and approaches

The towers are the main elements which give opportunity to and call for architectural treatment to lend the structure monumental character. Each tower will rest on a base 215 feet by 75 feet and rise to a height 650 feet above water.

The character of the bridge approach on either side will be in harmony with the rest of the big structure. At the New Jersey end the roadway will strike the face of the Palisades cliffs about 50 feet below the top of the cliff. From this point it will rise in an open rock cut to the surface with an easy grade. In order to keep the silhouette of the Palisades intact, the cut is to be screened by a rock-faced masonry portal through which the roadway will enter and which will be utilized to carry a footwalk across the top. Hudson Terrace, a north and south artery, will be slightly depressed to pass under the bridge approach. An appropriate plaza of the circular type is recommended for the end of the approach because it permits of great flexibility in the handling of traffic and in connection with existing and future highways.

On the New York side it is proposed to have a comparatively short approach with an easy grade which will cross Riverside Drive and the block west of Haven Avenue with three monumental masonry arches almost 120 feet above the surface of the drive. From Haven Avenue east the approach will consist of an embankment with plain outside walls decreasing in height from a maximum of 40 feet. An appropriate plaza is also suggested for the New York approach.

It should be noted that the character and length of the approaches will depend somewhat upon the municipal authorities on each side of the river with whom these and other matters concerning the bridges are now being discussed in friendly conferences.

Construction program

It is believed that the construction of the bridge may be started before next summer and that the structure itself can be opened for pedestrian and vehicular traffic by 1932. The following tentative construction program has been arranged:

- 1927—Construction of foundations for the towers.
 1928—Erection of towers and partial construction of anchorages.
 1929—Erection of steel anchorages and cables.
 1930—Erection of steel floor structure and part construction of approaches.
 1931—Placing of roadway and footwalk deck and completion of approaches.
 1932—Opening of bridge for initial traffic.

Detailed estimates of cost

As has been stated the estimate of the cost of opening the bridge in initial stage is \$50,000,000. This is made up as follows:

ESTIMATED COST FOR INITIAL CAPACITY OF FOUR-LANE VEHICULAR AND BUS PASSENGER TRAFFIC AND PEDESTRIANS:

Construction:	
Bridge proper	\$27,100,000
Approaches	4,000,000
<hr/>	
Total construction	\$32,000,000
Engineering (design, supervision and inspectional).....	2,000,000
Administration (general and legal staff and office).....	500,000
Real estate	7,000,000
Contingencies	3,000,000
Interest during construction.....	5,500,000
<hr/>	
Total Cost for Initial Capacity.....	\$50,000,000

Traffic estimates

Estimates of the traffic which may be expected to utilize the Hudson River Bridge have been based upon ferry counts and upon calculations regarding the development of the Fort Lee District in Bergen County generally, and upon studies of the effect upon Brooklyn of the opening of the Brooklyn Bridge across the East River. The following table shows the result of these calculations:



The Outerbridge Crossing.

Year	Number of Vehicles	Number of Passengers in Vehicles	Number of Pedestrians	Number of Busses
1932.....	8,148,000	18,898,000	1,413,000	497,000
1933.....	8,734,000	20,017,000	1,519,000	519,000
1934.....	9,310,000	21,181,000	1,578,000	544,000
1935.....	9,870,000	22,327,000	1,690,000	569,000
1938.....	11,339,000	25,721,000	1,968,000	654,000
1943.....	13,236,000	31,039,000	2,392,000	812,000
1950.....	14,997,000	38,567,000	2,890,000	1,092,000
1960.....	16,310,000	50,362,000	3,196,000	1,616,000

An average toll of 50c per vehicle was eventually chosen to calculate the revenues as being a fair approximation of the average rates now charged on the ferries in the immediate vicinity of the bridge. Additional estimates for average tolls of 60c and 70c were made for passenger vehicles and trucks.

For long distance buses the toll now charged by the ferries was used. This is \$1.00 per bus. For the local buses running from plaza to plaza, 75c was adopted. An average toll of 5c per passenger in vehicles, exclusive of the driver, and for pedestrians, was employed.

Revenues estimated

The following estimate of net revenues, interest, sinking fund payments, and net annual surplus were based upon the traffic forecasts and calculated on the average tolls given above:

Year	Estimated Net Revenue	Interest	Sinking Fund Payments	Net Annual Surplus
1932.....	\$5,250,000	\$2,250,000		\$3,000,000
1933.....	5,600,000	2,250,000	\$100,000	3,250,000
1934.....	5,950,000	2,250,000	200,000	3,500,000
1935.....	6,400,000	2,250,000	200,000	3,950,000
1936.....	6,850,000	2,250,000	1,500,000	3,100,000
1937.....	7,300,000	2,205,000	1,500,000	3,595,000
1938.....	7,850,000	2,160,000	2,500,000	3,190,000
1939.....	8,200,000	2,070,000	2,500,000	3,630,000
1940.....	8,600,000	1,980,000	3,000,000	3,620,000
1941.....	8,900,000	1,867,500	3,000,000	4,032,500
1942.....	9,200,000	1,755,000	3,000,000	4,445,000
1943.....	10,500,000	1,642,500	3,500,000	5,357,500
1944.....	10,800,000	1,507,500	3,500,000	5,792,500
1945.....	11,000,000	1,372,500	4,000,000	5,627,500
1946.....	11,400,000	1,215,000	4,000,000	6,185,000
1947.....	11,600,000	1,057,500	3,750,000	6,792,500
1948.....	11,900,000	888,750	3,750,000	7,261,250
1949.....	12,100,000	720,000	4,250,000	7,130,000

Year	Estimated Net Revenue	Interest	Sinking Fund Payments	Net Annual Surplus
1950.....	12,400,000	528,750	4,250,000	7,621,250
1951.....	12,600,000	337,500	2,750,000	9,512,500
1952.....	12,800,000	213,750	2,750,000	9,836,250
1953.....	13,100,000	90,000	1,000,000	12,010,000
1954.....	13,300,000	45,000	1,000,000	12,255,000

Financing of the Hudson River Bridge

Owing to the magnitude of the project the Commissioners of the Port Authority felt it was necessary to insure a substantial margin over the \$50,000,000 estimated as the cost of opening the Hudson River Bridge to traffic. It was decided to authorize a bond issue of \$60,000,000 which it was felt would take care of all contingencies and also furnish funds to begin immediate enlargement of capacity after opening the bridge, in case the traffic should demand it. Obviously all of the money would not be needed at once and it was determined in the fall of 1926 that the initial bond offering would be in the amount of \$20,000,000, that sum being deemed sufficient to meet the initial payments for substructure work to purchase properties needed at the start and to meet other preliminary costs. Bids for this bond issue were opened on December 9th. Many of the most prominent investment houses of the country participated in the bidding and alternative proposals involving different rates of interest, different maturities and different conditions as to calling of bonds for payment were offered.

After mature consideration, the Commissioners came to the conclusion that one of the bids of a syndicate headed by the National City Company calling for 4 per cent bonds, maturing in amounts of \$1,000,000 each year from 1936 to 1942 inclusive; in amounts of \$1,500,000 each year from 1943 to 1948 inclusive, and \$2,000,000 each in 1949 to 1950, and callable after December 1, 1936 at par, was most advantageous. The bid for these bonds was 95.6377 per cent representing an interest cost to the Port Authority on the net proceeds of 4.242 per cent annually.

Immediately upon the receipt of the money representing the proceeds of the bond sale the final borings were started

preliminary to the preparation of specifications for the substructure work upon which it is hoped shortly to invite bids, a further report on the Hudson River Bridge is to be made.

Bayonne-Port Richmond Bridge Studies

The appropriations for the Port Authority studies for the Bayonne-Port Richmond Bridge became available on July 1st.

The traffic studies for the Arthur Kill Bridges, of course, furnished a basis for estimating the probable use to be made of the Bayonne-Port Richmond structure bridge and the revenue which might be derived therefrom, but these estimates were revised and brought up to date. A survey corps was organized and very complete topographical surveys of both Bayonne and Port Richmond were made, covering the areas which might be traversed by a bridge, and sufficient triangulation was done to enable the staff to determine the distance between pierhead lines and get such other information as was necessary for the various locations under consideration.

The distance between the shores of Kill van Kull is such that several types of bridges are under consideration. The designs therefore covered suspension, cantilever, and an arch type with the floor suspended beneath. The staff is now engaged in determining which of these types will be most economical and desirable. Consideration has also been given as to whether the bridge shall carry railroad tracks for freight or rapid transit purposes.

Because of the fact that rock outcrops on the Bayonne side it was not necessary to make borings there, but on the Staten Island side sufficient borings have been made to determine the fact that a pier may be advantageously located close to the pierhead line at either of the locations which have been studied. It is contemplated that further surveys and borings shall be made when the project has reached a more definite stage.

A tentative report on the Kill van Kull Bridge will be issued shortly.

FINANCIAL STATEMENT — ARTHUR KILLS AND HUDSON RIVER BRIDGES — AS OF DECEMBER 31, 1926

RESOURCES	Arthur Kills bridges	Hudson River bridge	Total
1. EXPENDED FOR CONSTRUCTION OF BRIDGES:			
Representing expenditures for preliminary surveys, engineering, cost of land, payments for construction work, interest and discount on indebtedness, and other costs of construction.....	\$3,028,150 11	\$321,410 46	\$3,349,560 57
2. CASH—AVAILABLE FOR CONSTRUCTION			
Representing unexpended balances of proceeds from sale of Port Authority Interstate Bridge Bonds—Series "A" and "B," and from advances made by the States of New Jersey and New York in aid of construction of the Arthur Kills and Hudson River Bridges.....	13,210,612 01	19,185,944 42	32,396,556 43
3. APPROPRIATIONS FOR PRELIMINARY BRIDGE SURVEYS			
Being unexpended balances available from appropriations of States of New Jersey and New York for preliminary surveys, borings, engineering and traffic studies, etc.		48,442 64	48,442 64
4. UNMATURED ADVANCES IN AID OF CONSTRUCTION			
Being deferred and contingent amounts which the States of New Jersey and New York have agreed to advance in aid of construction of the Arthur Kills and Hudson River bridges.....	2,400,000 00	10,000,000 00	12,400,000 00
5. UNAMORTISED DISCOUNT ON FUNDED DEBT			
Representing balance of discount on Port Authority Interstate Bridge Bonds—Series "A" and "B"—which will be extinguished by charges to construction and to operation over the life of the bonds.....	368,870 46	812,814 32	1,181,684 78
Total.....	<u>\$19,007,632 58</u>	<u>\$30,368,611 84</u>	<u>\$49,376,244 42</u>

FINANCIAL STATEMENT—ARTHUR KILLS AND HUDSON RIVER BRIDGES—AS OF DECEMBER 31, 1926—(Continued)

LIABILITIES			
	Arthur Kills bridges	Hudson River bridge	Total
1. LONG TERM DEBT			
Being Port Authority Interstate Bridge Bonds—Series "A"—\$14,000,000.00 dated March 1, 1926, and Series "B"—\$20,000,000.00 dated December 1, 1926, which were issued to obtain funds for construction of the Arthur Kills and Hudson River bridges.....	\$14,000,000 00	\$20,000,000 00	\$34,000,000 00
2. AUDITED VOUCHERS PAYABLE			
Being current accounts which have been vouchered but not paid by banks to December 31, 1926.....	591,486 19	1,609 85	593,096 04
3. ACCRUED INTEREST ON LONG TERM DEBT			
Being current accrual to December 31, 1926, of interest due March 1, 1927, and June 1, 1927, on Port Authority Interstate Bridge Bonds, Series "A" and "B"...	210,000 00	66,666 70	276,666 70
4. ADVANCES FOR PRELIMINARY SURVEYS			
Representing amounts repayable to the States of New Jersey and New York when the costs of construction of the Arthur Kills and the Hudson River bridges shall have been fully paid for and the debts created for such purpose amortized.....	199,918 20	299,921 97	499,840 17
5. ADVANCES IN AID OF CONSTRUCTION			
Representing amounts repayable to the States of New Jersey and New York from revenues or tolls from the operation of the Arthur Kills and the Hudson River bridges. Such repayments are due to be made at the rate of two per centum per annum of principal amounts after the payment of all expenses, interest, amortization and sinking fund charges on obligations issued by the Port Authority.....	4,000,000 00	10,000,000 00	14,000,000 00
6. UNADJUSTED CREDITS			
Representing credits for expenditures charged to construction of the Arthur Kills and Hudson River bridges from appropriations made by the States for general administrative expenses.....	6,228 19	413 32	6,641 51
Total.....	<u>\$19,007,632 58</u>	<u>\$30,368,611 84</u>	<u>\$49,376,244 42</u>

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