

Why The LIRR Was Built:

In Response To A "Micro Ice Age" (That Blocked Steamboat Navigation 100 Days A Year)

FOREWORD:

Unknown until now, the true underlying reason behind the creation of the LIRR, was as a response to a "Micro Ice Age" that regularly blockaded New York Harbor's access to the Hudson River, as well as access to Long Island Sound. On average, L.I. Sound navigation was blocked by ice a hundred (100) days a year, between mid November, and mid March (Albion, pg 14, 31).

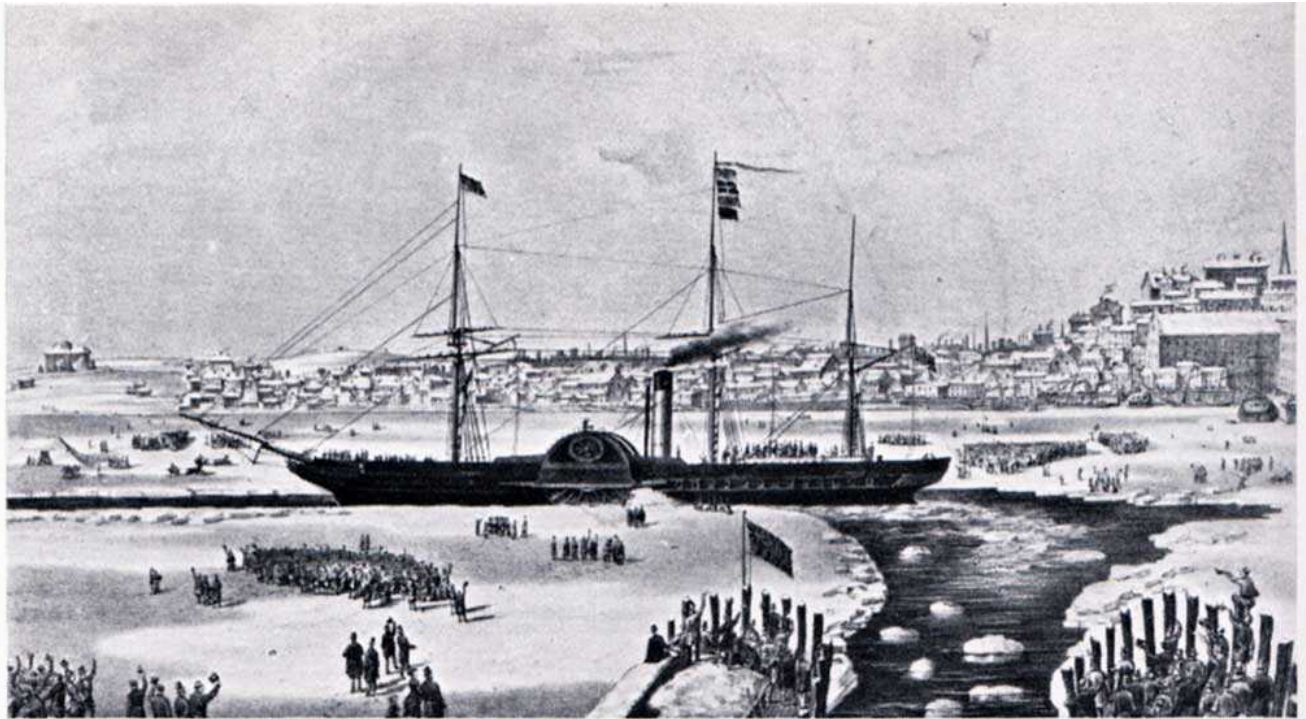
This annual obstruction to navigation, greatly impaired steamboat traffic- and thereby commerce- between New York and Boston, spurring the construction of a much more reliable transportation mode: a railroad (See Poussin, pg 10).

For roughly three months a year, this adverse weather condition virtually stopped all commerce between New York City and Boston, the former serving as "middle man" and "banker" for the highly lucrative Southern cotton trade exports, as well as imports to the South, and the latter city, the seat of the American Industrial Revolution (textile manufacturing in particular)- also the only U.S. seaport hosting the "Atlantic Ferry" (fortnightly, then weekly) service to Liverpool, U.K., provided by the steamships of the Cunard Line.

For New York City to retain its preeminence in these business arenas, a "weather proof" method of transportation between New York and Boston would have to be created: a railway.

Sources: The Rise of New York Port [1815- 1860], by Robert Greenhalgh Albion, 1939, pg 14, 31. and Picture History of the Cunard Line 1840- 1990, by Frank O. Braynard and William H. Miller, Jr., pg 2.

It's noteworthy, that the circa 1848 inauguration of a new, larger (longer range) class of Cunard steamship, and its change in terminus (from Boston to New York City), coincides with the demise of the original LIRR New York Harbor to Boston route (c. 1846-1847). The larger Cunard ships were built (in part) to compensate for the demise of the LIRR connection to New York.



Cunard *BRITANNIA* [11] in the ice at Boston,
February 1844

(*Mariners' Museum*)

Picture from: *Passenger Lines of the Western Ocean*, by Comdr. C.R. Vernon Gibbs, R. N. (Ret.), 1957, p 390

It should also be noted, that in 1852, 1856 and 1867, the East River between Brooklyn and Manhattan was solidly iced over. Pedestrians and horse drawn vehicles easily passed over the ice between the two cities. Source: [History of the City Brooklyn, by Henry Stiles, Volume II, 1869, Pg 488- 490.](#)

The LIRR Route to Boston Via Stonington, Conn., As Described In The Year 1836

Translated From The French by Isabelle Dupuis, With LIRR Section Translated By Bob Diamond,
Using Google Translate (and much common sense)

A Partial Translation of the book *Chemins De Fer Américains* By Guillaume Tell Poussin, 1836

Conversion Factors (relevant only to this work):

1 meter = 1.0936 yd

1,760 yd = 1 mi.

1 League [de Paris] = 2.422 mi., apparently rounded off to 2.5 mi.

(descends from the distance a man or horse could walk in one hour)

\$ 1 = 5.355 francs circa 1836, as per *The Financial Register of the United States*, Vol I, pg 84, 1838

Preface:

According to Poussin, the LIRR was created as part of “The Atlantic Line”, a system of east coast railroads extending from Boston to Charleston, SC, where it would connect with the proposed “Gulf of Mexico Line” to New Orleans. At the time, the LIRR was considered the superior route, as its projected construction cost was less than 1/5 of the Connecticut shore route, while also providing a competitive travel time and fare.

For a look at “The Atlantic Line” as it existed circa 1836, see Poussin's list at the end of this paper. Poussin's original book (in French) can be read and downloaded here <http://books.google.com/books?id=MZkOAAAAYAAJ&printsec=frontcover&dq=chemin+de+fer+americains&cd=1#v=onepage&q&f=false>

This rail system was planned to ultimately extend from Maine to California, eventually reaching its west coast terminus via a southern route (see Gadsden Purchase http://en.wikipedia.org/wiki/Gadsden_Purchase). Once completed (1869- 1909), the several transcontinental rail lines would develop the U.S. western frontier, and also serve as through routes to the Orient.

Title Page

AMERICAN RAILWAYS
HISTORY OF THEIR CONSTRUCTION,
Factory Price and Income
Adopted Administration Mode
Summary of the Legislation that Manages Them

Follow-up to

INTERNAL IMPROVEMENT WORKS, etc.

By Guillaume-Tell POUSSIN
Former Major in the American Corps of Engineers
and Camp Aid to the Engineering General Bernard.

Time is money

PARIS.
Carilian-Goeury, Bookseller
For the Royal Corps for Highways and Mines
Quai des Augustins, N • 11
1836

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The subject of this publication is to present a thought out analysis of the railroads that were built or that are under construction in the United-States. In a previously published book, we gave a history of the important internal improvement works executed by the general government of the American Union under the direction of a commission especially entrusted with the direction of this vast system. We were then unable, less we were to stray from the goal imposed by the very title of this first publication, to examine, as it deserves to be, the important topic of railroads; in this new publication, we believe we must provide all the information which can help in understanding the many implementations made on the American territory of this powerful auxiliary to the prosperity and the civilization of modern people.

Introduction

When we want to cite one example of the practical implementation of great discoveries that are useful to industry's progress, and consequently to the prosperity of people, we are forced to turn our gaze towards the *United States of America*. Providence seems to have placed there the world's great practical school in order to make all modern discoveries fructify. Because in order to do so, a virgin territory

and active, entrepreneurial and free men were needed: North America alone presented the necessary convergence of all of these conditions.

If we owe it to Columbus' genius to have guessed the existence of our globe's biggest continent and to have endowed Europe with it, we also owe recognition to these perseverant and brave men who were the first to confront the dangers of a wild environment, who withstood the bad weather of a bitter and harsh climate to implant civilization on this land which it was to so promptly inseminate; to these men who, having made a religion from their rights, fought to conquer and to transmit to their children the first of all possession – freedom! One of them in particular deserves humanity's homage: Washington --justly named the father of the American homeland, a unique example of moderation and of disinterest in the exercise of supreme power, which he only served in order to consolidate the freedom of his fellow citizens and to guarantee their national independence. It is this truly great man who was the first to understand that prompt and easy communication routes were the best way to propagate freedom and to elevate the human race to the highest degree of civilization by improving its lot. What Washington had planned in order to connect the first settlements that were founded on the Atlantic coast with those created by brave adventurers in the West's great valley, beyond the Alleghany mountains, we see it being accomplished nowadays by the wise men who succeeded him in advising the state.

If Washington did more than any other to found the prosperity of his country by guaranteeing its independence and by bestowing it with wise institutions, Fulton, in another career, contributed no less to the edification of this social monument of which the New World shows us such an admirable example. He discovered the useful application of steam in navigation and endowed his homeland with this rich heritage.

Beginning with this discovery, the still little known huge rivers that water America's vast territory, and which were hardly crisscrossed but by the Indians' numerous canoes, became the easiest and above all the fastest means of communication; from this day onwards, civilization finally planted the flag of its peaceful conquest beyond the Alleghany.

Soon, in Europe, the savants Bolton and Watts made this precious new discovery take a new step: they increased the relative strength of the steam engines by adopting a system of generators that diminished the volume of these machines and hence prepared the application of steam for use in furrowed routes--discovery whose civilizing influence may, one day, produce greater feats, like a moral effect on the populations of the old continent, than steam ships were able to accomplish on the people of the western hemisphere.

The application of steam, as a means of transportation on earth roads, was promptly appreciated; the commercial spirit felt all the advantages that it could draw from a greater celerity in its affairs. Hence the hearth from which shot out the first creative spark of this beautiful modern invention was also the point from which it received the promptest development, and we have seen the principle and the application of railroads assimilating themselves in the United States almost at the same time as their discovery was being made in Great-Britain, and propagating themselves with a promptness unknown anywhere else.

It is true that several reasons were to uphold the almost generalized adoption of this new means of transportation in the United-States. First, few roads had been built at great cost or in a permanent manner; although the American territory was crisscrossed by a great number of roads, all of them were natural or built only as a chore, most often by federal troupes. Some of these so-called barrier roads are better cared for in terms of their tracing, construction and are above all better maintained, but the funds

devoted by companies to these types of projects rarely produced beyond 4%; they often bring in much less because they are undertaken not so much with the goal of benefiting from toll rights as with that of giving greater value to land properties and to facilitate business relations. Secondly, properties being still rarely divided on this immense territory, the same owner sometimes owns several leagues of land that is barely cleared; hence, this land has little value and it is common to abandon a portion of it free of charge when business might give a real value to a property which would otherwise only have a fictional one. On the Atlantic coast, where the population is denser, properties are more divided and the land has a greater value, but there, moral and political considerations exert a salutary influence in favor of these grand and beautiful industries. We give great importance to them because we consider them to be the main reason for the state of prosperity that has reached this nation of yesterday by constantly marching towards a state of progress that no other people can exemplify. That is because in America, the value of time is appreciated: it is used -we wear it out.

This real value, given to time by this people, where the spirit of speculation is the basis to almost all social relations, becomes, so to *say*, an element that is numerically represented by each individual of this great community; as such, he who does not link himself to society through a useful occupation seems to not belong to it and is almost considered like a *pariah*. Here, as elsewhere, everyone takes care of his personal well-being, but since society is organized in such a way that this well-being can only be found in relationships of partnership, it leads to this extraordinary activity which makes civilization make such rapid progress with this young and entrepreneurial people.

This explanation of the dominant character of North America's inhabitants will help better understand the presentation we are going to make of the wonderful development, in this country, of the use of railways and of the general disposition towards facilitating all industrial industries.

Since the introduction, in 1826, of this means of transportation, North America has literally covered itself with a network of new roads that have created relations between the most extreme points of the republic, and which help all the products of industry find favorable markets and propagate themselves on all the points they cover.

It is to the description of the whole of all these railroads, the different means of transportation that have been applied to them, the artworks they required, and the administrative mode that manages these beautiful industries, that we devote the following pages, convinced that it will not be without interest for learned men to thus follow the details of the circumstances which determined the adoption of such and such a track or of such a construction mode.

It is not with the intent of offering an example to be followed in all of its aspects that we have undertaken this work, because, in our opinion, nothing can be exactly imitated, insofar as the local circumstances of a country and the national character of its inhabitants can require different means; but we believe that one can always benefit from the experience of others, and that it is a duty for whoever was able to collect this experience in its very location, to reproduce it and to submit it to his compatriots in the hope of being useful to his country.

We have divided this book into four parts; in the first, we describe all the railroads that were built or are being built along the Atlantic; in the second part, all the railroads built with the goal of uniting this first railroad with the inside of the country or the West. These two parts give an overview of the entire double communication system that is followed. We have described the most notable railroads that have been built up to this day, the different means of construction adopted according to the location or the destination, the revenue for each given example and finally, their yield.

The third part contains details about the administrative economy of American railroads, calculations for the cost of repair, maintenance of the tracks, engines and transportation material--in other word, anything that has to do with the administration of this industry.

In the fourth part, we assembled all the legislative documents about railroads, their policy, and the adjudication of labor, in other words, everything that relates to this industry in American legislation.

First Part

The Atlantic Railroad

Overall view – Northern America presents the most favorable physical configuration for communication works, either by canals or by artificial roads. One of the most remarkable circumstances is, without a doubt, the layout of its huge navigable rivers, its large bays, its straits and its lakes which contribute to create an internal navigation whole incomparable on any other continent. It creates a natural and parallel canalization belt on the coast, more than 1800 leagues [approximately 7200 kilometers or 4.473 miles] from development, on which sailboats can sail sheltered from storms from the eastern extremity of the Union until the Gulf of Mexico. Another circumstance, no less remarkable, and perhaps even more important given the influence it exerted at the beginning of the first settlements on the purpose which any internal improvement project was to present, is the absolute division of the country by the Alleghany mountain chain into two big sides, east and west.

The eastern side was the first to be inhabited: the Atlantic states were also the first to feel a need for communication and to take care of the means to establish it between the eastern and the western states, and between the Atlantic and the Gulf of Mexico; this primitive idea, the greatest, the most fruitful of them all, came to preside and to direct all the individual efforts which the needs of the first settlements called for.

Such is the great and simple basis of the system of communication roads provided, so to speak, by the physical layout of the country; it was also the one which the *commission for internal improvement* imposed on itself when it had to take care of the gigantic project which was the subject of our first publication about the United-States.

Railroads are but a complement to this first undertaking and fall under the same classification. We will thus distinguish, under the denomination of *Atlantic Line*, all the railroads that tend to create a second artificial communication belt parallel to the coast, and under that of *Atlantic towards the West*, all of those which tend to create or to activate direct or indirect business between this first line and the regions that lie to the west of the Alleghany mountains.

The greatest centers of population can be found along the coast, already united by steamships, which, up until now, have seconded in such a remarkable manner the commercial spirit of the inhabitants of the Atlantic coast. Nonetheless, this means of communication was not complete, it left long intervals which had to be filled by terrestrial roads and, overall, these modes of transportations, too slow for the Americans' active and locomotive spirit, no longer filled the greater and more pressing needs for exchange and relations between these different masses of inhabitants. It is this need to create new relationships on the same coast which gave birth to this national conception, whose benefits will make themselves felt on the furthest generations-- that of establishing a railroad line on the Atlantic coast. It will one day link Boston to New Orleans and go through all the capitals of the Atlantic states.

Such a project bore too general an interest for it to be neglected, and as such, its execution was immediately taken on by creating a systematic union between existing steam navigation and planned or existing railroads.

We will begin the description of this great Atlantic Line by going from east to west, and will consider Boston, the capital of Massachusetts, as its eastern point of departure, and Charleston, in South Carolina, as its end point in the south-east.

Single Track Railroad from Boston to Providence

A communication line, which goes through all the big cities along the Atlantic coast, was one of the most interesting in the Union because of the frequent interaction that commercial trade demands between different centers of action. It was also on the construction of such a line that the interest of this country's capitalists entrepreneurs centered on, and the projected railway between Boston and Providence was the first link of this great line, on the execution of which the public's attention immediately focused...

Single track railroad Jamaica to Greenport

Indeed, the steam navigation on the Sound (a strait created by solid ground and Long Island), guaranteed a 12 to 15 hour communication between New York and Providence, located at the beginning of the Narragansett bay in the state of Rhode Island; via water, this distance is estimated at 80 leagues [approximately 320 kilometers or 198.8 miles]. From Providence to Boston, the distance, via an ordinary road, is of seventeen and a half leagues [approximately 70 kilometers or 43.5 miles], and required on average five hours with an ordinary car, which placed New York at a distance of twenty hours from Boston. In the winter time, when the ice blocks a large number of ports in the North, and steam navigation therefore finds itself forcibly suspended, the traveler, whose business calls him from Boston to New York, is forced to follow on solid ground the detours of the mail coach. This journey is close 120 leagues [approximately 480 kilometers or 298 miles], therefore very long and above all very tiring.

The navigation of [Long Island] Sound suffers frequent delays, due to steamboats that are exposed to bad weather or winds on inlet [to the Sound], to a very great extent in winter, [and to] the accumulation of ice towards the outlet of the East strait, [often] entirely suspend[s] the same [L.I. Sound navigation].

To obviate the interruption, detrimental to relations between the two cities as large as Boston and New York, two projects have been proposed to provide direct communication at all times.

One such project would continue the journey on land, moving away as little as possible from the shore of the Sound, so you do not increase too much development [construction costs], we evaluated the length of that road 241,396 meters, about 60 leagues [150 mi.], and [would have] expended [for its] complete construction a [sum of] 30 million francs [\$5,602,240.80].

The second project is expected to follow throughout its length Long Island. The island covers the Sound or the Strait Sea coast, and extends parallel to the coastline, [from] the state of Rhode Island [to] the harbor of New York, where it forms the main shelter to the east. The railroad on Long Island would be connected to the railway Boston [&] Stonington [by] a steam ferry established between Stonington and Greenport, which is only separated by 9 leagues [22.50 mi.].

The port is [the] harbor of Greenport recently [founded] , located about 2 leagues [5 mi.] to the west of the mouth of the river Connecticut, which has a great depth of water, and, unquestionably, may be

deemed to be among one of the best anchorages throughout this portion of the eastern coast and is accessible at all times and by every wind [direction?]. This road would be properly located to form the warehouse or transfer point for this new land communication with the east.

The total length of track on Long-Island is estimated at 131,963 meters or 33 leagues [82.50 mi.], and as the land on which it is to be located is entirely alluvial [sand and gravel] without exception, its execution would require no expensive artificial construction, either as masonry or earthwork, and it is estimated that a league [2.5 mi.] [of] such a road could be constructed for 120 [thousand] francs or 40 francs per linear meter [\$12,021.39/mi.].

In summary, the total distance between Boston and New York, following the new route would be 334,373 meters, or 83 leagues and a half [208.75 mi.], including 9 leagues [22.50 mi.] [which] would be made by steamboats; the [entire] distance could be traveled in 11 hours [and a] half.

A company [the LIRR] -has been formed for the execution of this road, the capital stock was increased to 7 million francs [\$1,307,189.50].

It [the LIRR] has established its calculations of income on the following overview of the [present] situations of the commercial movement between the different points [which] are the most immediately concerned [with] the execution of such a line.

It [the LIRR] assures [us] that the completed line will have the carriage of passengers between Providence, Newport and New York, for 30 francs [\$5.60] per person [and] would produce an annual [revenue] of 2,375,000 francs [\$443,510.73] [carrying 79,167 passengers].

It is assumed that only half [the passengers] [would utilize] the operation of the railway company, [or] 1,187,500 francs [\$221,755.36] [annual revenue].

The [annual Pre- LIRR] passenger [traffic] [between] Stonington, Norwich, New London and New York, has produced 1,300,000 francs [\$242,763.77].

[Pre- LIRR] Passenger transportation on Long Island produce[s] 290,000 francs [\$54,155].

The transport of goods rises to 735,000 francs, half [to] the railway, [or] 367,500 francs [\$68,627.45].

[Pre-LIRR] Transportation of packages, etc. 50,000 francs [\$9,337.07].

Total annual income based upon the present [pre-LIRR] [1836] state of things [is] 3,195,000 francs [\$596,638.65].

The present population of Long Island rises to 90,000 souls, including real estate properties are evaluated at 110,000,000 francs.

Such a glimpse was enough to foresee what was to have great[ly] [described] the execution of a railroad on Long Island. Such a company [LIRR} was organized, which has entrusted the leadership of this great enterprise to Mr. [William Gibbs] McNeill, chief engineer of the Boston [and] Providence Road. We start on an interesting part of this line, one that stretches from Brooklyn [to] Jamaica:

Single track railroad from Jamaica to Brooklyn

Jamaica, capital of Queens county, is a village around which one can find a rather large grouping of villas or country houses belonging to New York's rich merchants; it's the point where Long Island's rail road currently ends in the east.

Brooklyn is its end point in the west; it is a city of 20 thousands souls whose commercial prosperity can be felt by its advantageous position, at the mouth of the East River's straits, vis-à-vis of New York with which it communicates regularly via steam ferries that constantly crisscross each other as they pass from one shore to the other.

It is thus, above all, with the goal of disgorging in some manner, on Long Island's advantageous position, part of New York's overabundant population, that the Jamaica railroad has been undertaken.

The track studies were done by Mr. Douglass and gave 19, 312 meters for the overall development of its tracks, or approximately 5 leagues [approximately 20 km or 12.42 miles]. These tracks will be used by locomotive machines.

The terrain is extremely favorable to building a railroad, as the *maximum* slope never goes beyond (illegible) or 31 millimeters per meter. In addition this slope maximum is reached over just a very short distance, from the moment the tracks are forced to cross a dune that lies over the entire expanse of the island and which divides the waters almost equally.

Hence, these tracks leave from inside Jamaica, which is located east of this dune; they reach via a regular incline this splitting ridge, and continue with a regular downward slope of 330° , or 3 millimeter per meter, towards Brooklyn which is situated westwards.

No waterways had to be crossed, and the natural terrain was in fact already adapted for leveling over a very long distance; generally speaking, there were very few excavations.

In localities where the terrain found itself far below the track's level, some sort of scaffolding in the shape of an easel was laid to support the tracks.

For this railroad, a mode of construction was adopted for the tracks that is a little different from the one used for other railroads; the cost of expenditures is lower and it is estimated that its lifespan will be just as great; this is what it consists in. Pl. i, *fig. 2*. As resting points, erect pieces of wood were substituted for the transversal and longitudinal supports, separated one meter from one another, from center to center. These blocks of wood are 30 centimeters in diameter and 1 meter high; they rest on the natural ground with their biggest extremity as a basis. One took care to lay out these blocks in the same natural direction, in relation to their grain, as that of their growth. The earth was then strongly packed down around each block, which was then sawed from the top to the level adopted for the rails.

Every second row of these blocks were then transversally attached with a rather thick iron bar that is held onto the blocks with cramps but adjusted in such a way as to not go beyond the blocks' surface. A warm greasy coating was then applied, the effect of which will protect the blocks' extremities against the injuries of time.

The rails are salient and have a flat sole; they rest directly on the head of these blocks. This construction method came to only 17 francs per meter for a single track, not including the excavation work, or 68 000 francs per league. By including all the costs, the league should come up to 120.000 francs, or 30 francs per meter regardless of height.

It has been estimated that such a construction could last 15 years before any of the blocks need to be

replaced; replacement which could always be done to the tune of 24.000 francs per league.

Here are the different wood species that were used for this construction

Locust tree, *robina pseudo acacia*, L.

Larch, *larix*.

White pin oak, *quercus alba*.

Pine, *pinus abies*, — *primus*.

Chestnut tree, *castanea*, L.

The total cost of construction is estimated at 800.000 francs, of which 250.000 francs are for the indemnity pursuant to the acquisition which the rail road company was forced to make of the gated road that already existed between the two outermost points of the projected track in order to meet one of the clauses of its concession act (see note C, fourth part).

The interest of such a capital, at 6 for 1, is of 48.000 francs.

Administrative costs are evaluated at 15.000

Annual repairs at 15.000

Total annual spending 78.000 francs

Railroad summary chart - Single-track railroad from Jamaica to Brooklyn

Length 19, 312 m

Purchase slope

Maximum slope 1/264

Minimum Slop 1/330

Inclined plane 0

Estimated cost 30 fr.

Effective Costs

Motor Machine

Curve range

Speed per hour 18 m

Rail weight 5 kg

The stock of this company is currently worth 115.

Atlantic Line

Communication between New York and Philadelphia

New York and Philadelphia are the two biggest cities in the United States. New York, the Union's business capital, now has a population of 220.000 souls, its merchant marine is estimated to be more than 330.000 barrels, and in 1834, the revenue of its customs contributed 50 million francs to the public treasury.

Philadelphia has close to 120.000 souls, its exterior commerce, less active, is represented by around 100.000 barrels, but this city is also home to an agronomist and manufacturing population. It has become the most active home of the most recognized civilization, one that knows how to spread benefits to the furthestmost regions of its immediate influence, in other words, on all the members of the great family. Philadelphia is, without a doubt, in relation to the big state of Pennsylvania, of which it is the true capital, what the state itself is in relation to the American confederation, a perfect model of the most recognized and the most equitably distributed social well being.

For a long time, these two cities had been benefiting from two great modes of communication: one for travelers, over approximately 40 leagues [approximately 160 km or 99.4 miles], covered in ten hours, and the other for the transportation of goods via a canal and covered in twenty-four hours. Railroads added their vivifying action to all these advantages of location by facilitating to the highest degree the relationships between these two cities since they somehow gathered into a common center two great centers of commercial activity and made them afterwards partake in the advantages which each benefited exclusively from up until now.

There are two projects that aim to place Philadelphia seven walking hours from New York; one takes advantage of the steam navigation that is already established on part of the route between these two cities; the other would accomplish its route solely on the ground. Funds are spread over these two projects; the first is entirely completed and open to full traffic, the other is underway and already completed over a very large portion of its track. We will first concern ourselves with the first of these projects...

Ligne de l'Atlantique.

Considérations générales sur le double système de communications suivi aux Etats-Unis	1
Chemin de fer de Boston à Providence	3
» de Providence à Stonington	7
» de Long-Island	10
» de Jamaica à Brooklyn	12
» d'Amboy à Camden.	16
» de Paterson.	20
» de New-Jersey.	22
» de Trenton à Philadelphie	25
» de New-Castle à Frenchtown.	28
» de Philadelphie à Baltimore	32
» de Baltimore à Washington.	34
» de Fredericksburg à Richmond	46
» de Richmond à Petersburg.	51
» de Petersburg au Roanoke.	54
» de Portsmouth au Roanoke.	54
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On the next two pages: "Appendix A" and "Appendix B".

sharply eastward, across the Atlantic to Europe, was only one of the four directions in which a vessel might leave New York. On the other three routes as well, New York made innovations. One of these also led down the bay, but upon reaching Sandy Hook, bore southward along the New Jersey coast toward the cotton ports. Another, starting with the East River and the tortuous channel of Hell Gate, led to the quiet waters of Long Island Sound and toward New England. The fourth route was up the Hudson, from which a vessel might connect with New York's unique water-level way to the West.

On the southern coastal route, New York developed what was perhaps the cleverest step of all, by diverting the commerce between Europe and the cotton ports some two hundred miles out of its normal course, in order to collect toll upon it and at the same time to provide eastbound cargoes for Liverpool. Cotton became New York's most important article of export and the South received most of its foreign imports by way of New York. The South passively allowed New York to gain this strangle hold on its trade and to strengthen the arrangement with the packet lines to the cotton ports. In several ways this fitted admirably into New York's concentration of commerce, giving it an excellent market for the distribution of its imports and at the same time providing return cargoes for the eastbound transatlantic shipping. Without those the Atlantic shuttle could not have operated successfully, while British markets were closed to flour and grain, the principal northern offerings.

From the commercial standpoint, the route through Hell Gate to the Sound was the least important of all, for the New Englanders to the eastward were too energetic traders themselves to be as easy subjects of exploitation as the southerners. The Sound, however, was admirably adapted for an extension of New York's energetic use of the steamboat. The successful introduction of steam navigation slightly antedates our period, for it was 1807 when Fulton's *Clermont* began its runs on the Hudson. Steamboat traffic on that river had steadily developed, but the British blockading squadron had prevented such service on the Sound until the first weeks of peace in 1815, when the *Fulton* began her runs to New Haven. Before long, this was extended to Providence and intermediate points, greatly facilitating traffic to the eastward and helping to bring southern and western New England within New York's sphere of commercial influence. Steamboat service was also rapidly developed during the decade on the route across the

their piers. Vessels tied up at the outer end of wharves were particularly vulnerable. On a December day in 1831, after a huge ice floe had drifted from the Hudson into East River so that hundreds crossed "free of toll," *The Post* remarked:

It often happens that a temporary bridge of this kind is formed, and is the cause of great damage, carrying before it all vessels at anchor. In one instance we recollect a brig, loading at the end of one of the docks, was cut in two, from stem to stern . . . she sunk so quickly that the stevadores in the hold had great difficulty in escaping with their lives.

While the harbor itself remained relatively ice-free, New York was annually affected when the freezing of the Hudson cut it off from Albany and the interior. Various tables are available showing the date of the closing and opening of navigation on the river—a hundred days was the general average for ice, extending from late November to early March. Sometimes unlucky sloops were held imprisoned in the ice for months; and one of the crack river steamers, wintering at Albany, was carried down river to destruction when the ice went out. The shallow Erie Canal was frozen solid for an even longer period each year—an average of more than four months. The New York end of Long Island Sound was also frequently liable to long obstruction by ice. In the early days of steamboats, service was generally suspended both on Sound and river from mid-November to mid-March.

To appreciate New York's relative advantages in the matter of freezing, we might turn to a few of the rival ports for comparison. Naturally, most of those to the northeast suffered more severely. Montreal and Quebec were generally cut off from the open sea about five months each year, a situation which would give Portland some seventy years of prosperity as the winter port of Montreal. Even Portland, however, sometimes had its harbor frozen solid as far out as House Island in the ship channel. Boston, too, suffered far more often than New York from freezing. Wide publicity attended the action of the Boston merchants who subscribed several thousand dollars to saw a seven-mile channel through the harbor ice so that one of the first Cunarders might sail on time. Portsmouth alone of the eastern ports was apt to remain ice-free, thanks to the swift rush of the currents which accompanied its abnormally heavy rise of tide. In compensation, however, that same current was pretty much of a nuisance to shipping during the rest of the year.