

The Pneumatic Mail Tubes: New York's Hidden Highway And Its Development

**An Historical Perspective
It was not a Pipe Dream!
By Robert A. Cohen**

Copyright © August 1999

Introduction

In 1971 the Post Office Department became a quasi-private federal agency with the new name of the United States Postal Service. It no longer looks toward Congress to appropriate money; it must sustain itself. At the very beginning of my career with the Postal Service in 1972, I met people who were employed by the original Post Office Department and knew of the Pneumatic Tube System. They would talk of a system of underground tubes around New York City that transported mail from one station to another. I wish I had listened more closely at that time. I was quite young and I had other interests on my mind. All I can now recall is their pointing to a section of the building where the tubes came up through the floor. I heard a few stories about its normal operation that always fascinated me. There were cylinders into which mail could be placed and sent through the tubes. I guess I had the same reaction that I get today when I tell people about it. It is usually disbelief. The whole idea was an anachronism to me. It was something you might see on the old TV series the "Wild Wild West." The old-time postal workers also had colorful stories of the extraordinary use of the tubes. Supposedly, there was a cat sent through the system from one station to another just to see the reaction. I was sure that an order of a corned beef on rye with a knish and a pickle had been transported through the tube system from the post office nearest the Second Avenue Deli.

Over one hundred years ago Postmaster General (PMG) Charles Emory Smith predicted the Pneumatic Tube Service's delivering mail to every home in the upcoming twentieth century. He was partially correct. In 1910 the U.S. Post Office Department initiated the policy of home delivery of mail to every home in the nation. That service to every home is still in effect in spite of its annual cost. The Pneumatic Tube Service did not last as long, as a direct result of its annual cost.

In October 1997 the 100th anniversary of the Pneumatic Tubes passed without any official recognition. My interest was taken just before that time, when the curator of the postal museum in New York City told me about that upcoming event. I began researching and looking for any remnants of the tubes. My imagination went wild with images of my predecessor postal employees working the system and the heavy equipment used to transport and receive the carriers. I had recollections of the stories I had heard earlier in my career. I was amazed and fascinated when I learned of the tubes traversing the Brooklyn Bridge. The fast action of the system caused it to be described as "Mail shot from Guns". Its travel routes caused it to be described as "Subterranean Mail"

How could the one hundredth anniversary of the Pneumatic Tube system pass without recognition? How could such a marvel be forgotten? I have not forgotten it. Here is what I have learned.

Inception

The beginning of the system was not a "Pipe Dream". The creators had a plan and each step in the evolution of the system led to an improvement on the last.

In 1867 Alfred Ely Beach, who some of you may recognize as the editor of the Scientific American in the middle 1800s, wanted to build a subway in New York City. Past experience from experiments of others in Europe steered him away from steam locomotion within an underground tunnel. The steam and smoke caused severe problems to the eyes and noses of the passengers. Beach felt that air power, as the means of locomotion was the best method to employ successfully in a closed underground environment. Beach studied the early nineteenth century Danish theory: "the creation of a vacuum in front of an object could produce tremendous atmospheric thrust behind it". Mr. Beach applied to the city for authorization to build this subway car and track. The New York City council membership was in the control of the disreputable, and notorious, Boss Tweed.

Nothing could get through his "Legislature-for-Hire", without Tweed's authorization. As Tweed and Beach had contempt for each other, Tweed was completely against Beach's plan to build this subway.

Beach also had theories about an underground Pneumatic Tube System for mail that would have pick up and drop off points at lampposts throughout the city. The clever Mr. Beach, as a ruse, applied for authorization for construction of a pneumatic tube to carry mail around the city. He was successful in his lobbying efforts and the Pneumatic Tube System Bill passed through the city legislature. Beach secretly started the construction below a store on Warren Street in old downtown New York City. However, the construction he began was not for the pneumatic tube for mail. Instead Beach began construction of the Pneumatic Subway (Figure 1). He played the politics games well and asked the Legislature for an amendment to make the tube larger. Using this new authorization for the large tube he was able to complete his actual goal of the time, the Pneumatic Subway.

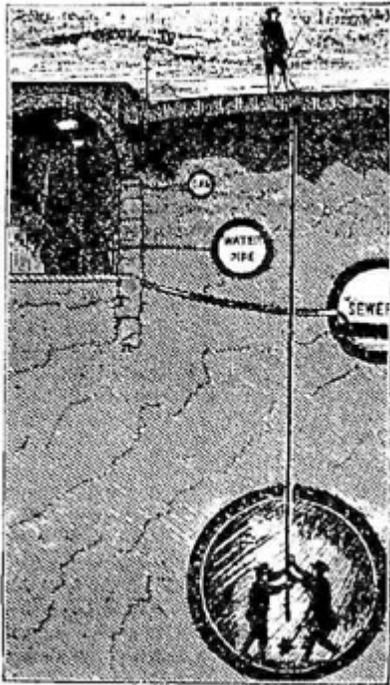


Figure 1. Workers check direction of digging during tunnel construction.

It was a very ornate project. The subway station was adorned with frescoes and easy chairs. Zircon lamps revealed the luxurious interiors of the stations. The subway car was also surprisingly ornate, luxurious and comfortable. This was very a pleasant and unexpected surprise for the first paying viewers (Figure 2).



Figure 2. New York Socialites prepare to enjoy the ride in the Pneumatic Subway.

In order to stay within the law and his city contract, Beach built a pneumatic tube system for the mails. It was on a very small scale. One thousand feet of eight inch pipe. It carried letters and papers at a speed of 60 mph. The system was connected to a hollow lamppost-drop on the street above. Beach's small prototype subway never really developed into anything, but his pneumatic tube system has the distinction of being the first mail tube in the U.S.A. Eventually he had the tunnel sealed.

Forty-two years later New York City subway construction workers fortuitously came across Beach's Subway tunnel. It is unnecessary to say they were shocked at their archeological find. It was incorporated into the subway system. Supposedly, there is a plaque in the Brooklyn/Manhattan Transit (BMT) City Hall Station marking the site of Beach's vision.

Pneumatic tubes to carry mail were being developed in London, Germany and Paris. These systems lasted longer than the American systems, but they were only two inches in diameter. Therefore, they could not carry much mail. In Paris the Carte Pneumatique also known as "The Pnue", remained in operation until 1987 with 269 miles of tube. It was mainly used for telegrams and special delivery.

The Beginning of the U. S. Post Office Department's System

Credit for the original pneumatic tube system idea must be given to Dennis Papin, an engineer whose paper on the "Double Pneumatic Pump" was presented to the Royal Society of London in 1667. Almost two centuries later it was put into operation in London by Latimer Clark. The first operational internal facility Pneumatic Tube System in the U. S. A. was installed in 1887 at Lynn, Massachusetts. Western Union had a small external Pneumatic Tube System between two of its offices in New York City in 1888. Investigation at the time showed that pneumatic tube service used for commercial purposes was not a success. The system used commercially in Boston was eventually leased to the Post Office Department.

From 1889 through 1891 there was a series of annual reports to Congress by the PMG. These reported on investigations into the feasibility of implementing a pneumatic tube system for movement of the mail. In the Act of July 13, 1892, Congress authorized an investigation into the "Rapid Dispatch of Mail by means of Pneumatic Tube". It appropriated only \$10,000.00

Immediately thereafter Postmaster General Wanamaker solicited bids for contractors to build the system. He received eight bids, but if the bidder did not already have a pneumatic tube system in existence, it would have to build one at its own expense to conduct a test for the government. The successful bidder was the Pneumatic Transit Company of New Jersey.

The original agreement was to build and install all tubes, power, receiving and sending stations at each facility without any cost to the government. The Pneumatic Transit Company of New Jersey would incur this total cost. After the trial run period there was an agreement made to lease the system at a cost based on a rate per tube mile. The tubes were six and one half inches in diameter.

The initial test location was Philadelphia. The very first test was conducted on March 1, 1893, between the Philadelphia General Post Office and the East Chester Street Post Office. It was a distance of .58 miles. The test was successful and tube service officially began in Philadelphia. On October 15, 1897, the service in New York City began. Eventually, Pneumatic Tube Service was put into operation in Boston, Chicago and St. Louis.

On August 1, 1898, tube service began over the Brooklyn Bridge to the Brooklyn General Post Office from all post offices in Manhattan, New York (Figure 3). In New York there was a contract between the U.S. Post Office Department and the "New York Mail and Newspaper Transportation Company". New York City's system was constructed in stages with additions over the years based on need. There were two service points in Brooklyn and eventually one at the Bronx General Post Office. They were connected with 23 post offices in Manhattan.

The first cylindrical carrier to travel through the New York City system was one that contained a Bible, a flag and a copy of the Constitution. The second contained an imitation peach in honor of Senator Chauncy Depew, a driving force in this project. He was fondly known as "The Peach". A third carrier had a black cat in it, for reasons unknown to this author.

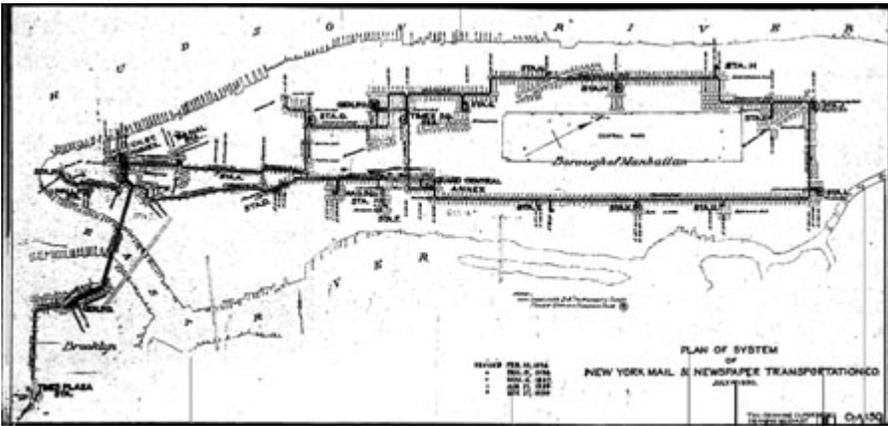


Figure 3. Map of Pneumatic Tube System in New York City.

The initial Congressional authorization in 1898 was for sixteen and two tenth miles in all cities. In 1916 the authorization was increased to 113 miles. The following is a breakdown of the tube distance authorization for the cities and the operating companies. New York City had 55.5582 total miles of tube, operated by The New York Mail and Newspaper Transportation Company. Boston had 13.6378 total miles of tube operated by the Boston Pneumatic Transit Company. St. Louis had 3.9760 total miles of tube operated by The St. Louis Pneumatic Tube Company. Philadelphia had 19.9998 total miles of tube operated by Pneumatic Transit of Philadelphia. Finally, Chicago had 19.814 total miles of tube operated by The Chicago Postal Pneumatic Tube Company.

The operation of the Pneumatic Tube System involved air forced cylinders known as "carriers", traveling in a spinning motion, through a well-greased tube at 30 miles an hour. At its peak productivity six million pieces of mail would whisk through the system daily at a rate of 5 carriers a minute with each carriers maximum load of approximately 500 letters.

Pipe Design, Materials and Specifications

The tubes were made of cast iron with a bored inside diameter of eight and one-eighth inches. This size of tube in a double-tube configuration had the capacity to transport 200,000 letters an hour. Postal officials had always specified eight-inch tubes. A committee of postal experts estimated that eight-inch tubes were sufficient for present and future requirements. Eight-inch tube was the maximum size that could fit on the postal work floor. Each tube had a 9/16" inch thick wall and a special finished spigot and socket for correct alignment when the tube sections were joined together. Lead joints maintained the air seal needed. Direction changes were made by gentle tube bends and a larger bored diameter that allowed the carrier to negotiate the turn. The tubes were fastened together by bolted flange. They were buried four to six feet below the busy streets.

New York City has a series of complex structures and rocks underground. This constrained the tubes, requiring them to be installed in the most practical rather than the most direct routes. There are ten north and south thoroughfares that handle New York City's underground utility traffic. Six of them are occupied by subway systems, the balance being used by public utility companies. Therefore sometimes the tubes were installed along the top of the existing subway tunnels. Another amazing feat was the traversing of the Brooklyn Bridge. The flexibility of that structure required various special devices to keep the tubes in alignment.

Carrier Design, Materials and Specifications

There were 95,000 steel cylindrical carriers that were said to resemble artillery shells or torpedoes (Figure 4). They were 24 inches long, 8 inches wide and they weighed 21 pounds. There were doors on each end that locked by cam. The carrier could not be placed into the sending unit for entry into the tube unless the end doors were locked. This was to ensure they would not open en-route and cause the mail to get damaged. Inside, the cylinders were 22 inches long and 7 inches wide. They were capable of holding five hundred letters. These dimensions were just under the size of the pipe and resulted in a snug fit. A felt strap on each end of the cylinder maintained an air seal.

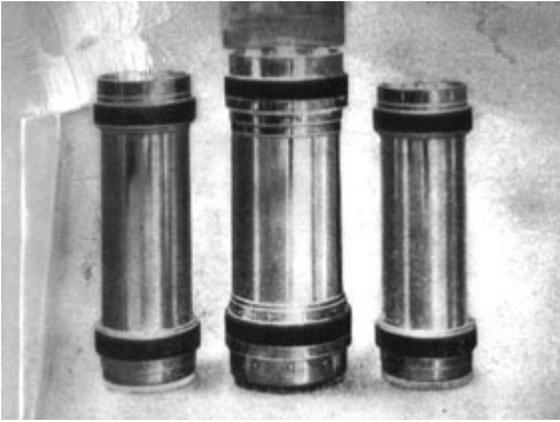


Figure 4. According to information printed with this picture of the capsules (carriers), "Government Experts estimate that every day 20,000 letters are advanced by the 'Pneumatic Tube Service'. Twenty-eight hundred Carriers are constantly in motion traveling from one Post Office Station to another through the Pneumatic Tube Systems."

Power Stations

Power stations consisting of positive rotary blowers and reciprocating air compressors driven by electric motors provided air pressure ranging from three to eight pounds per inch (Figure 5). The carriers had the potential to travel up to 100 miles an hour but because of the many turns, carriers' travel speed was kept at 30 mph

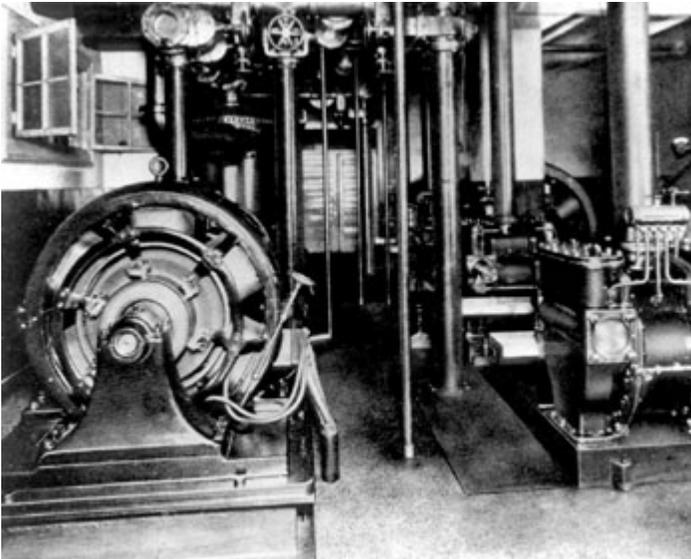


Figure 5. Power Station Generator.

Sending & Receiving Units

Skillfully controlled air pressure allowed the carriers to gently reach their destination and land on an apron device-receiving tray (Figure 6).

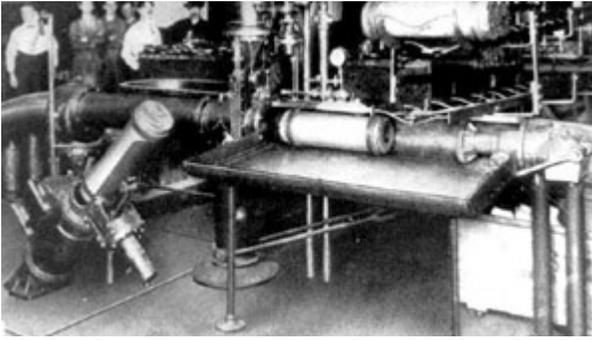


Figure 6. Transmitters and Receivers in Postal Station A, New York.

Operation and Maintenance

Maintenance was the responsibility of the system's owners in each of the cities where leases existed. The responsibility of the operation of the entire pneumatic tube system was in the hands of the Post Office Department.

The person responsible for the sending and receiving of the carriers was known as the Operator or Rocketeer. There were 136 Rocketeers in New York City (Figure 7). Dispatchers manned a telephone intercommunication system and ensured operations were not interrupted. They were also trained in the system's technical details. The telephone number of the tube room at the General Post Office was Pennsylvania 6-7000. In the 1940s, the "Swing" bandleader and music composer Glenn Miller put a similar telephone number (Pennsylvania 6-5000) to music. That telephone number was located right across Eighth Avenue from the General Post Office in Pennsylvania Station.



Figure 7. New York Postal Workers, also known as the "Rocketeers" are shown sending the mail on its way.

To keep the system well lubricated a perforated carrier containing oil would be sent out periodically through the entire system.

Each of the regular carriers had an outside label and it was not opened until it reached its final destination. They traveled through the tube to the next post office where the label was read and the carrier was then placed back in the tube to be sent onward, until it reached its marked destination.

Carriers could be dispatched at a rate of five a minute, that is about one every twelve seconds. In the 1950s during their regularly scheduled operation time period, 55% of all New York City mail traveled through the system. The hours of operation were 5:00 AM-10:00 PM Monday-Friday; 5:00 AM-10:00 AM Saturday, and No Service on Sundays and Legal Holidays. A snow emergency could prompt the system to run 24 hours a day. This system enabled mail to travel under the snow covered and clogged streets thus avoiding traffic congestion

for the mail truck drivers and unnecessary mail delays. The blizzard of 1947 in New York City did not prevent the Post Office from living up to its motto "Neither Snow Nor Rain Nor Heat Nor Gloom of Night Stay These Couriers From The Swift Completion Of Their Appointed Rounds". The mail flow continued underground and without interruption throughout the crisis.

The occasional carrier stalls in a tube it could be easily detected. Each receiving machine was equipped with a "tell-tale" fan. If a carrier failed to arrive on time the air pressure would fall to level that would cause the fan to stop revolving. The operator at the affected station would call the switchboard at the telephone number PE 6-7000. On a control board there, the blocking carrier could be located through colored lights designating each station. In 99% of the cases the arrested carrier could be made mobile again by increasing the air pressure behind the blockage and decreasing air pressure in front of it. This would in effect cause a vacuum. In the 1% of the time that these methods did not work a maintenance crew would have had to go out and dig up the streets.

Cost of the Lease

In the very first year of the Pneumatic Tube System existence, the Post Office Department did not pay for the service. However the next year they began paying at a rate of \$4000.00 per year for those .56 of a mile tubes. In 1917, \$17,000.00 per mile per year was the lease rate for all cities. That was more than the cost it required to carry mail on the railroad. In a proposal of April 21, 1932, The New York Mail and Newspaper Transportation Company offered to lease the system to the New York Post Office for \$515,946.60 from July 1, 1932, through June 30, 1934, at a rate of \$19,500.00 per mile. In January 1951 a ten-year contract was signed with The New York Mail and Newspaper Transportation Company at a cost of \$1,226,000.00. That contract was never completed.

Congressional Reviews

In 1907 U.S. Postal Inspectors issued a report covering the Pneumatic Tube Service in which it was stated, "This is the most expensive method of mail transportation in use at the present time, and the Inspectors very much doubt whether the advantages obtained are commensurate with the heavy expense."

As stated earlier the whole Pneumatic Tube System was leased to the Post Office Department, and the contract was renewed periodically. Due to this method, the Congress had to authorize the appropriation. Congress reviewed annual reports in order to determine if the service should be continued. The Postal Appropriations Bill of June 30, 1899, prohibited any new contracts for Pneumatic Tube Service. This prohibition continued until June 30, 1901. Therefore, suspension of service occurred in all cities in from July 1, 1901, through June 30, 1902.

Some early Congressional limitations placed on the Pneumatic Tube System were: Contracts were written for 4 years or less; there must be a favorable annual report by the PMG; and no contract could be for more than 4% of the gross postal revenue. After June 30, 1904, renewals had to be provided for in the annual appropriations bill. By imposing these restrictions Congress placed a ceiling on the cost.

In 1906 the pneumatic tube contract expired. The government was unable to secure bids in several cities. Their recommendation was for the service to be discontinued in: Chicago, Philadelphia, Boston and St. Louis; however, it should be continued in New York City. At the insistence of the Pneumatic Tube companies and because of the political strings that may have been pulled, the contracts were extended by the Postmaster General until June 30, 1916, and later extended by Congress until March 3, 1917. The final extension ended June 30, 1918.

A committee report to the PMG October 13, 1916, found the following in relation to the Pneumatic Tube System:

Advantages:

1. High rate of speed between stations for limited quantities of mail.
2. Freedom from surface congestion.

Limitation and disadvantages:

1. Only five pounds of mail could be carried in each container; and all classes of mail could not be carried.

2. The minimum time between dispatches is 15 seconds allowing only 20 pounds of letter mail each minute. Therefore, vehicle service would be required to carry mail during heavy volume times.
3. The inability to carry special delivery parcels due to the size of the carriers.
4. The relays at station are built in delays but they are unavoidable requiring all stations to be manned and open during operation.
5. The inability to dispatch between intermediate stations during continuous transmission between any two points,
6. Inability to dispatch to railroad companies without additional handling.
7. Complaints resulting from careless locking and accidental opening of container in transit causing damaged mail.
8. Dampness and oil damage to mail.
9. Service interruptions block an entire line.
10. Congestion from heavy mail volumes.
11. Equipment takes up rented building space.
12. Excessive costs

By 1918 there was a growing debate about cost versus benefits of what had been essentially developed as an inner city business district service. After World War I, Congress hesitated at the price tag to continue the service. At this time Congress also reviewed the facts regarding the Post Office Department's decision just a few years prior, to begin Parcel Post service. This class of mail was too large to utilize the Pneumatic Tube Service. Suspension of service occurred in all cities in 1919, 1920, 1921, and 1922. In 1922 the system was resurrected in New York City and 4 years later in Boston

The End of an Era

Recently I met an old friend who told me her father was once a rocketeer. In conversation with him I learned that he had spent some time working on the Pneumatic Tube System at the Bronx General Post Office. I had an old map showing the proposed tube run from Manhattan to the Bronx. He assured me that the extension to the Bronx was completed. A "swish and a thump" were his description of the sounds of the arrival and departure of a pneumatic carrier. The torpedo loading similar to that seen in a World War II, movie is how he described the Bronx tube room. He remembers that the carriers were very dirty and oily. Sometimes the bosses gave out aprons to the workers but most of the time you were told to wear dirty clothes. He told me something off the record. Since there was a renowned sandwich shop in the vicinity of the Bronx General Post Office, they often got orders from the downtown postal stations. The sandwiches were delivered through the system. Now that's what I call a real submarine sandwich!

The original concepts and design of the Pneumatic Tube Service were conceived with tunnel vision. Larger tubes would have meant more flexibility and room for change with time, but a larger tube would have required more expensive and larger equipment. The larger carriers would have been more expensive and heavier. Congressional restrictions and reviews were a deterrent to private companies. They did not want to bid on a negative cash flow business. From the very beginning the system had to justify its cost.

Eventually, because service was being hampered by systematic delays and because of the introduction of the automobile, the Post Office Department began leaning toward abandoning the tubes. While all other means of transportation had improved the tube system did not. The frequency of carrier dispatch and their capacity did not change. Both of these factors controlled efficiency of the system. The system remained stagnant. As mail volume increased over the years the volume of mail transported by pneumatic tube became minuscule in comparison to the entire volume of mail. A comparison of the Pneumatic Tube System to a funnel would give an understanding of why it became antiquated. It takes a certain amount of time for a gallon of liquid to travel through a funnel. Two gallons take twice as long to pass through. The value of the Pneumatic Tube Service decreased as mail volume increased.

Another negative position can be viewed through the following situation. When mail was sent to railroad stations it was handled twice. The mail was first sorted at the post office then transported by tube to the railroad. There it was sorted a second time according to railroad schedule and destinations. If the original sort at the post office, was the final sort needed for the railroad, that same sorted mail could be transported in less time by truck to the railroad station. That second unnecessary and time-consuming sort would have been eliminated. Using the tubes in this situation did not effectively save any time. The travel time saved by using the tubes was lost in the time working the second sortation.

In 1953 the new President, Dwight Eisenhower, appointed Arthur Summerfield as the Postmaster General. The controversy over the future of the pneumatic tubes finally came to a head. Even though in January 1951 a ten-year contract was signed with The New York Mail and Newspaper Transportation Company, Mr. Summerfield decided that the contract would be cancelled and the tubes were to be dismantled. The mail would be carried in the newly purchased fleet of trucks. It was felt that two additional trucks at a cost of \$25,000 a year would sufficiently replace the Pneumatic Tube System. This saved the one million-dollar outlay for the lease of the system. On December 12, 1953, service was suspended in all cities. The approximately 130 regular postal employees formerly assigned to tube service were reassigned to other positions in the postal establishment. Some of these workers are pictured in Figure 8.



Figure 8. A few of the 130 postal tube service employees reassigned to other positions when service was suspended December 12, 1953.

Destruction of the System

The original contract stated it was the responsibility of tube system owners to dismantle and remove the tube system from all stations. This was necessary to allow space for the new age of mail processing equipment. In the late 1950s The New York Mail and Newspaper Transportation Company sued the Post Office for breach of the 1951 contract and won a settlement.

In the Present

Periodically in New York City construction crews come across old pipe marked U.S. Post Office Department. They usually report it to the New York Postal Museum, and they are told not to be concerned.

Through my research I have located remnants of the system in three post offices in New York City. In two of them I found the actual pipe flanges coming out of the wall from beneath the city streets (Figure 9). Red brick that showed no sign of wear surrounds them. At Madison Square Post Office I recovered a page of old New York Daily News. This newspaper must have been used to fill the gaps between the tubes as they traveled between floors of the post office. The tubes were gone but the round molded impression in the leftover hanging concrete still had a full page of the events of September 21, 1937. In the movie section Spencer Tracy was starring in the motion picture "Big City".

Just think of some of the other events that occurred in 1937. There was a newspaper strike in New York City and Mayor Fiorello LaGuardia read the comics over the radio, to all New Yorkers. Amelia Earhart disappeared while flying, and The Hindenberg crashed.



Figure 9. Flanges that are remnant tubes at Old Chelsea Street Postal Station.

The Pneumatic Tube System was very a controversial system. If it had not been dismantled and it was resurrected today, I think the tube system would be able to provide a remarkably quick, city wide Express Mail service, that no private concern would be able to compete with effectively.

###

References

- "Adieu to the Pneu" by Otto Friedrich Time Magazine
- "America's Own Pneumatic Tube Mail Service" by Edward Harvey
- "Epochal Events In American Business"-Dunn & Bradstreet
- "Labyrinths Of Iron" A History of the World's Subways by Benson Bobrick
- "Mail Tube Grew Up With City", New York Times, January 30, 1954
- "Mail System Down the Tube" by Sidney C. Schaer-Newsday
- "Pneumatic Mail Service" - The Postal Record 1895
- "Radio In 1937" by Donna L. Halper
- "The Pneumatic Tunnel Under Broadway" - Scientific American 1870
- "The Pneumatic Mail Tube System of New York City" - Scientific American 1897
- "The Pneumatic Dispatch" - Scientific American 1867
- "The New York Post Office Underground Pneumatic Dispatch" by Gregory Marshall - University Of Missouri
- "Subterranean Mail" - Poste Haste-1960
- "Underground Mail Road " by James Vescovi

Excerpts from Annual Reports by The PMG 1916, 1917 and 1918
La Posta: A Journal of American Postal History

Joseph Cohen, Founding Curator, New York Postal Museum
Paul Konigsberg, Curator New York Postal Museum
Mr. Jack Steinglass, Retired Postal Clerk, U.S. Postal Service
Megaera Ausman, US Postal Service Historian
James H. Bruns, Director, National Postal Museum Smithsonian Institution