

## AFD Ep 389 Links and Notes - Pneumatic Tubes (Bill/Kelley/Rachel) - recording July 18

- [Bill] Intro: This week on the show we're talking about pneumatic tubes, whether for mail distribution, in-store cash circulation, or even moving people around a metropolitan area. For a time, during the transition between the first and second industrial revolutions in the mid-19th century, it looked like pneumatic tubes might be the big wave of the future, and they certainly played an important role in certain industries for a century (and continue to exist in some places today on a limited scale). But ultimately, it was not to be.
  - One important thing to remember is that this experimentation with pneumatic tubes occurred partly in the pre-electrification era, and electrification helped solve many of the same problems pneumatics attempted to solve (like avoiding underground engines) and usually did so better or more easily.
  - As we discuss some specifics around mail delivery in this episode, you might also refer back for some important context to our US Postal History Episode from August 2020 (wherein among other things we talked about the rising volume of intra-urban postal deliveries during the 2nd Industrial Revolution): <http://arsenalfordemocracy.com/2020/08/04/aug-2-2020-crisis-on-infinite-post-offices-arsenal-for-democracy-ep-319/>
  - As always the sources today will be available at ArsenalForDemocracy.com with the episode upload, and we found some good ones today for sure. With that, I'll turn to .....
- Wikipedia (we didn't use it much this week): [https://en.wikipedia.org/wiki/Pneumatic\\_tube](https://en.wikipedia.org/wiki/Pneumatic_tube)
- [Kelley] Golden Era of Pneumatic Tubes: <https://www.vox.com/2015/6/24/8834989/when-the-pneumatic-tube-carried-fast-food-people-and-cats>
  - PTs designed to carry people, but turned out to be impractical over long distances.
  - In 1865, Alfred Ely Beach did build a system that would carry people one block and he sold 400,000 tickets for the demonstration in its first year. The system was shut down in 1873. [Rachel will discuss this more in a bit.]
  - USPS was an early adopter of the technology and the New York City Post Office, among others, used the pneumatic system.
  - A cat was sent to the vet in North Philadelphia using pneumatic tubes.
  - The increased efficiency of trucks did away with the demand for city-wide systems, but they were still useful within a building.
  - The increased use of email and fax made the building use less common as people had easier and faster ways to connect with one another.
  - A McDonald's in Edina, MN used PTs to deliver fast food until 2011.
  - Some hospitals still use PTs to carry lab specimens quickly across the hospital.
- [Kelley] Pneumatic System in NYC: <https://ny.curbed.com/2018/4/12/17226296/new-york-infrastructure-pneumatic-tubes-hyperloop>
  - In 1897, NYC post office installed PT, connecting their 23 post offices.
  - The cast iron tubes were buried 4-6 feet below ground and canisters with up to 500 letters were sent through the tubes.
  - At its peak use, 1/3 of the mail delivered in NYC traveled through PTs - about 95,000 letters a day.
  - However this system was expensive, with the post office paying a 17,000 annual rental payment for each mile of tubes, so the system was discontinued in 1953.
  - There's also a theory that the system was abandoned in favor of GM vehicles because the Post Master General appointed by Eisenhower and other influential figures had shares in GM. [Bill will talk more about the mail delivery topic in a bit.]

- Since 1975, Roosevelt Island has used PT to get rid of trash. Sanitation workers use PT to send trash to a compactor, where it is reduced to 1/20th the original size and then trucked off of the island.
- [Bill] [https://web.archive.org/web/20111211053544/http://www.postalmuseum.si.edu/museum/1d\\_Pneumatic\\_Mail.html](https://web.archive.org/web/20111211053544/http://www.postalmuseum.si.edu/museum/1d_Pneumatic_Mail.html) (Smithsonian Postal Museum)
- *In the United States, pneumatic mail was experimented with in the largest cities-Boston, New York City, Philadelphia, Chicago, and Saint Louis to varying degrees of success. The system developed by the Western Union Telegraph Company in New York allowed for the transfer of messages between main and neighborhood post offices and railroad terminals. Installation of the tubes was problematic, with previously laid pipes for sewage and gas limiting the size and thus the amount and kind of mail a pneumatic tube could carry. Water table levels also presented difficulties; in Philadelphia, some parts of a pneumatic mail system had to be buried 22 feet deep, or ten feet below the level of the water.*
- *Pneumatic mail service was also expensive. Since the tubing was dug, laid, and owned by private companies, the cities had to pay rent and labor. In Brooklyn alone, in 1898 the yearly cost ran from \$87,500 to \$152,597, depending on the number of branch offices served on the line. Mail was transferred between New York City and Brooklyn over the Brooklyn Bridge, a line that itself cost \$14,000 in rent per year and \$ 6,200 in labor.*
- *However, some cities were willing to pay the price for speed. Mail carried in pneumatic tubes traveled at speeds as fast as 35 miles per hour. Pneumatic mail service seems to have enjoyed its greatest success in New York City. Distances that had once taken up to 40 minutes by mail wagon could be covered by a cylinder sent through the pneumatic tube network in as little as seven minutes. Each cylinder (at least the ones in New York City) could hold 600 letters. Mail sorting also benefited by use of the cylinders-whereas the large loads of mail delivered by streetcar had to be sorted immediately on site, mail delivered by cylinder could be dispatched and sorted at intervals, and the entire load would be sorted and distributed before the streetcar could even reach the station. Pneumatic tube mail was one of the factors leading to the demise of mail-by-streetcar. Eventually, New York City would be covered by 27 miles of pneumatic tubes.*
- *Pneumatic tube mail was used in New York City until the 1950s. Service between Brooklyn and New York City was discontinued in April 1950 because of repairs on the bridge and was never restored. Service was suspended in 1953 for the rest of New York City, pending review. It had never been reinstated. However, use of pneumatic mail systems survived in Paris until 1983, when it was finally replaced by telexes and fax machines. The same sort of pneumatic dispatch system is still in use today at large stores such as Sam's Club and Home Depot, hospitals, and most familiar to most of the public, banks across the United States.*

[Rachel] <https://quod.lib.umich.edu/cgi/t/text/text-idx?c=moa;idno=AJR9164.0001.001>

This booklet was compiled out of press clippings in 1868 by Alfred Beach who unsuccessfully tried to promote a Pneumatic Power Railway in New York and got a short concept section built. (It's cool that they called the blower system an "Aeolor" after Aeolus the Mythological Greek Keeper of the Four Winds. And one clipping makes a comparison to Hermes for the mail service.)

- Beach aspired to speeds reaching 100 mi/hr, 4 times the speed of what locomotives at the time were capable of. He also pointed out that the weight of the cars would be much less than with locomotives, and the cost of wear and tear would be less as well.

- In 1867, he also extolled the cost savings of the passenger pneumatic system compared to other transportation projects. He estimated the PT system would cost \$100/ft, much cheaper than the Brooklyn Bridge, which was still in the planning stages. [great picture of the passenger cars on page 37].
- Much more practical was his concept for the Postal system, which did come to fruition and had much longer-lasting success than passenger pneumatic travel. The system was very clever, collecting and separating the incoming mail from the depots on its route, so they could more efficiently be delivered.
- *But all this is a sort of excrescence, the growth of a few recent years, upon the main body of our system of street transportation. The public cartmen number upward of seven thousand, with two hundred and seventy-five public porters. Of the private carts and wagons belonging to our wholesale merchants, manufacturers, and large retail houses, we can only make inadequate conjecture, so as to be within bounds. Of our eight thousand wholesale merchants, at least one thousand have their own carts. The manufacturers, who, for the most part, can not dispense with private wagons, can not possibly have less than two thousand of these in motion. Here are ten thousand vehicles in the wholesale way. Then we have seventeen thousand retailers and eleven thousand in mechanical trades. Of these, some three thousand grocers, and two thousand butchers and bakers, must have, nearly all of them, wagons for the collection of their numerous daily supplies of goods or materials, as well as for distribution to their customers. Allow them four thousand wagons, and let the other twelve thousand retailers have one thousand more. Total of public and private business vehicles fifteen thousand, beside expresses. Give them a low average of thirty parcels per day-many of them carry hundreds-and we have a total movement of four hundred and fifty thousand parcels. To these add fifteen thousand out-of-town express parcels, fifteen thousand suburban, and thirty thousand city, and we have a total of five hundred and ten thousand per day. Half a million of parcels and packages already passing through our streets daily by horse-power-to which we might fairly add a hundred thousand more by hand-furnish the existing basis of business strictly legitimate for the Pneumatic Dispatch, and capable of being transacted by that agency at a decisive saving in cost. The latter fact will be apparent on a simple calculation. The cost of a horse in this city, well cared for, is found by accurate account to be about sixty-five cents per day. The wages of employees are about three dollars, and the earnings of cartmen five or six dollars, at the lowest. Allow the men an average of four dollars, and let the wear of wagon and harness, with the expenses and wear of the horse, make up one dollar a day. Too little, every one will say; but here are over seventeen thousand horses, as many wagons, and as many men, maintained at a minimum cost of eighty-five thousand dollars per day, which is an average cost of seventeen cents for every one of the half million parcels they are supposed to carry. Of course the price paid, directly or indirectly, must be higher. Any one generally acquainted with such prices in the city will admit that twenty-five cents would be a medium estimate for the average. Reduce this price to an average of ten cents, which would be a lucrative rate for pneumatic transportation, and you have instantly the proper condition for doubling the business, which the quickness, certainty, and facility of the new method would soon double again. Again, as to capital: here are seventeen thousand horses, worth, on an average, three hundred dollars each, and as many wagons and carts, worth an average of two hundred dollars more; making a total capital of eight million five hundred thousand dollars invested in this business in the form of*

*horses and vehicles alone-enough to extend the pneumatic system through every thoroughfare of the city twice or three times over.*

(<https://quod.lib.umich.edu/m/moa/ajr9164.0001.001/57?page=root:rgn=full+text:size=100;view=image> )

[Rachel]

<https://web.archive.org/web/20110518013213/http://www.aqpl43.dsl.pipex.com/MUSEUM/COMMS/pneumess/pneumess.htm>

- A central exhaust fan (powered by steam engine) is used to move the air in a circular motion. Opening an inlet allows an item carrier to be sucked into the system to its final destination; the inlet door is then closed by the negative air pressure. Once the carrier arrives at its destination, gravity takes over and the carrier is dropped through a discharge door and air is circulated towards the inlet door.
  - In Great Britain starting in 1853, but improvements completed in 1870, pneumatic tubes were used to create a central telegraph dispatch. Telegraph forms were sent from local post offices to the Central Telegraph Office. This was a benefit to the local post offices, as they were only required to employ tube attendants rather than the skilled labor of a telegraphist.
  - In France from 1874-1964, pneumatic tubes were used to carry messages within a city; there were systems in Paris and Marseilles (opened 1910). Messages were sent to the closest stop, and the last leg was performed by courier. Messages traveled at an average rate of 1km/min. The Paris system had 3 circuits. Outward trips were propelled by air pressure from the rear, and return trips by vacuums. Some pumps in Paris were powered by pumping water into the system to increase air pressure. This was done in areas where steam-powered pumps were too noisy.
  - In the US, the first PT system was introduced in Philadelphia in 1893. By 1915, Philadelphia, as well as Boston, Brooklyn, New York, Chicago and St Louis had in total more than 56 miles of tubes in use.
- [Kelley] Future of Pneumatic Tubes: <https://www.wired.com/1994/05/tubes-2/>
- The PT industry is still a 50 million dollar industry in the US. While email replaces many of the messages that were once sent, there is still a need to transport tangible things within a workplace, like parts or samples.
  - Improvements have been made to make a “softer landing” for tubes in the system. Additionally computers and software can prevent some of the human mistakes, like putting in two tubes at the same time, making this a more reliable system.
  - One of the limitations is that these systems need space. The underground of NYC is so congested with subways, wires, sewer, etc that it would cost between 6 and 9 billion dollars to install the same PT system that once was.

Pneumatic tube networks remain a popular subject for heist plotlines in movies and television, such as the movie Logan Lucky which involves a heist of NASCAR track cash from a tube system during a race and the show White Collar which in one season involves reactivating the New York postal tubes system to move stolen cash.

Further listening on pneumatic transportation attempts: “Well There's Your Problem | Episode 17: The Atmospheric Railway” (Feb 2020) <https://www.youtube.com/watch?v=JaRVy31ITIQ>