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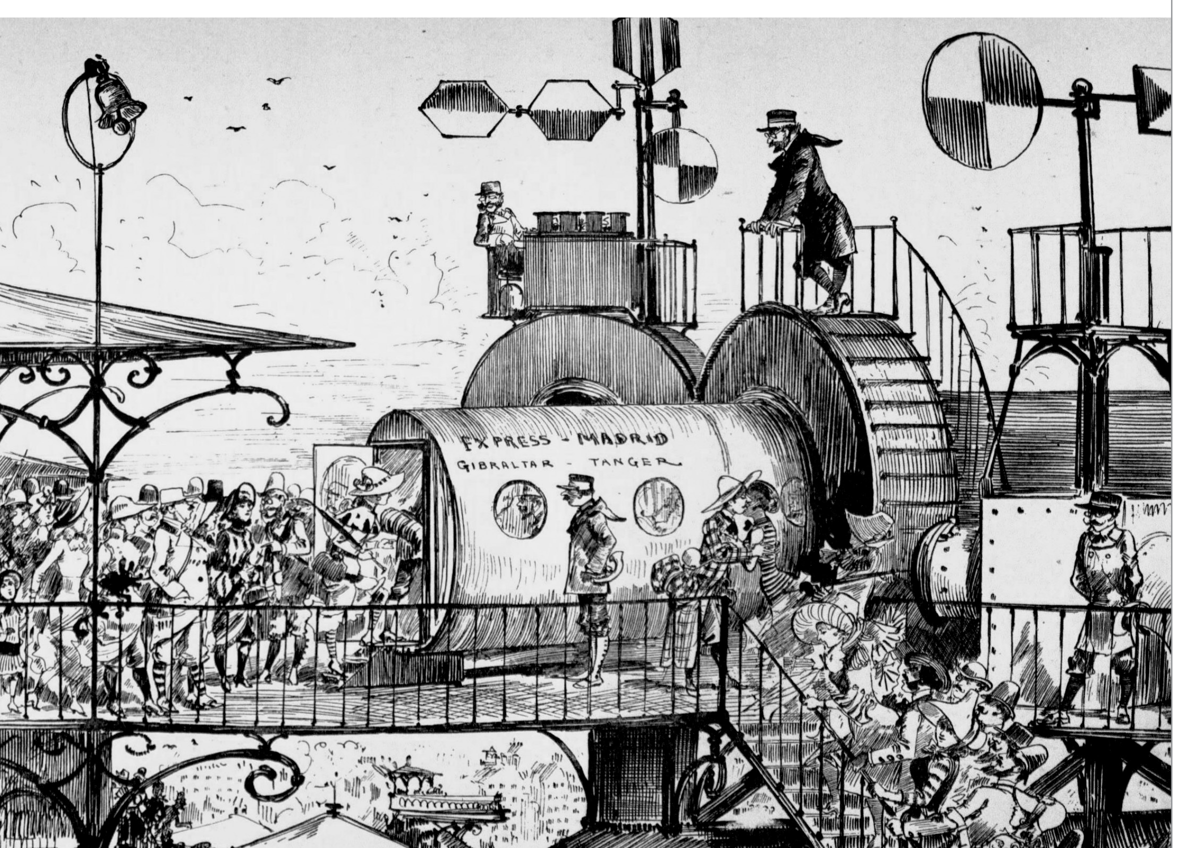
Of Loops, Pumps, Pipes and Hypes

(Carlos López Galviz)

To many in the early part of the twenty-first century, pressurized capsules, vacuum tubes, and a new generation of motors and air compressors are the solution to traffic congestion – a means to transport goods and people at high speed between Los Angeles and San Francisco, or between Helsinki and Stockholm, Dubai and Abu Dhabi, Edinburgh and London. But this is not the first time that compressed air and pneumatic tubes have been the future of transit. George Medhurst patented a pneumatic tube system for conveying people and parcels in England in 1810: laid "upon or under ground," his invention was designed to propel packets of letters "with the velocity of 100mph"; Baron von Rathlen's compressed-air vehicle is reported to have reached a more modest 12mph in 1848; John Gorrie's USA patent from 1851 provided the basis for the use of compressed air in refrigeration, key to the transport of food and other perishables a few decades later.

In other spheres, the history of pneumatic technology stretches much further back. Compressed air and hydraulic pumps were prominent in the intricate and often extraordinary mechanisms found in the subterranean chambers in ancient Egyptian temples; Ctesibius of Alexandria constructed a wind-gun making use of compressed air around 120 BCE. Later applications included Papin's experiments in the 1670s with "an air pump driven by a water wheel" which, significantly, was to enable transmitting motive power at a distance, and the pneumatic pumping engines installed in the mines of Chemnitz by Hoell in 1755. Early piston pressure machines of this kind were soon followed by a range of equipment for the construction industries, both structural and ornamental, as well as specialist tools ranging from medical instruments to artist's tools and cleaning devices in homes. This wide array of uses gained both momentum and focus during the nineteenth century, particularly in cities. What we can learn from this process and what a contrast between it and current developments such as Hyperloop might reveal are two of the questions I explore in this brief piece.



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From around the 1860s onwards, pneumatic tubes would help to alleviate street congestion by taking some of the traffic generated by letters and parcels off the streets in cities like London, Paris, Berlin, Boston, Chicago, New York, Prague, and Vienna. Through a system that connected post offices and their branches to railway stations, banks, government offices, hotels, department stores, and other businesses, mail was first sorted and subsequently pumped through pneumatic tubes to destinations across the city. In large cities, the system supplemented the telegraph as well as the post's own cadre of cyclists and runners, helping to reduce the pressure that the concentration, breath, and intensity of communication placed on existing infrastructure.

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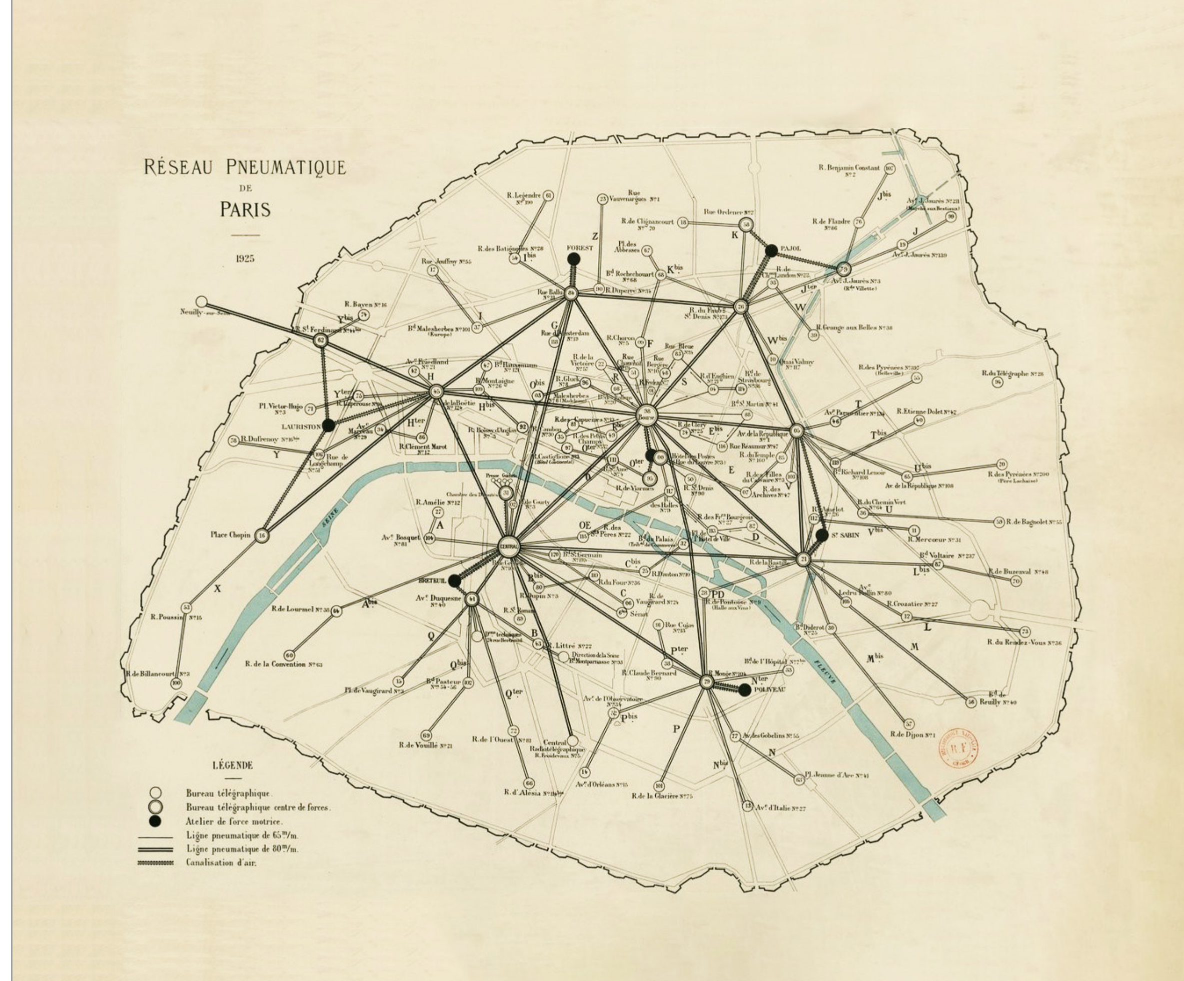

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The London Dispatch Company was among the first to provide this service, opening a line a few months after the first section of the Metropolitan Railway, the world's first "underground" railway, started operating in January 1863. The tubes covered a distance of 2.75 miles, between the Eversholt branch of the General Post Office (GPO) near Euston Station, the terminal of the London and North Western Railway, and the GPO's headquarters in St Martin's Le Grand in the City of London. Mail traveled in cars propelled at speeds that could reach up to 60mph, covering the distance from end to end in nine minutes. On occasion, the operators did the journey themselves, inside the cars, shot through the tube, with one description praising "the air being fresh and cool." Creating a sufficiently air-tight environment to secure the vacuum needed for the system to work proved challenging. Leaks were common. After just over 10 years, the company went bankrupt and the service – and the infrastructure that supported it – was forgotten for at least 20 years.

In Paris the experience of the pneumatic post, and compressed air more generally, was different. The “pneu” and other pneumatic networks used the sewers, which meant that the initial costs were significantly lower. From a test line connecting the Bourse (Stock Exchange) to one of the main telegraph offices in Grenelle (across the Seine), first laid in 1868, the pneu developed into an extensive network of pipes – around 240 miles at its 1930s peak – that allowed Parisians to send anything from theater tickets to bill payments to covert messages about political machinations from one end of the city to the other within the space of two hours. Embedded within the postal services – and culture – of the French capital, it remained operational until 1984, by which time it had long been overtaken by the telephone and telex.

The use of pneumatic tubes and compressed air in postal services was the result of a twin process, or more accurately a process with twin forces, namely a) the spatialization of different functions, that is, the fact that a network would support a particular kind of service and need (post, transport, water, electricity, and so on) and b) the specialization of these services and needs (first-class letters, express trains circumventing the city center, gas cookers in houses powered and heated by electricity, etc.). Networks develop to accommodate functions which are then spatialized and specialized. Often, they do so as layers, sections (a railway viaduct, a motorway, a walkway, a sewer) which cross one another, partly to avoid bottlenecks, partly to separate the matter, the things, and the beings which are “on the move.” Undergrounds, characteristically, are the space that accommodates the very functions which sustain the city above (sewers, catacombs, shelters, cellars, and storage rooms, metros, seed vaults, and more).

To an important degree, the emergence of networks of pneumatic tubes for postal services was an urban creation. Keeping communication flows between people and institutions was a challenge where that communication was dense, frequent and urgent, a situation characteristic of cities. To be sure, not all cities embraced the idea, or had the need of accommodating communication in pneumatic tubes. There were also significant differences between a capital city and regional centers, notably ports. By 1910 the British Post Office Telegraphs company had over 34 miles of tubes in London transmitting more than 32,000 messages a day across 41 offices and branches (including “spares”); in the port of Liverpool, a network of around 5.6 miles carried 10,000 messages a day across 9 offices, while the industrial powerhouse of Manchester merited only 5 branches and around 1.2 miles of pipes, through which 3,000 messages were transmitted daily.

A different kind of challenge is posed when the flow of communication is not just within a city, but between two or more cities – between Paris and London, for example. In 1885 Jean-Baptiste Berlier proposed to link the French and British capitals with a pneumatic tube for the transport of first-class letters. It would be more than a century before his idea of a fixed connection was realized in the form of the Channel Tunnel, which opened in 1994. Letters and parcels are of course only one of the many traffic flows the tunnel accommodates, alongside high-speed passenger trains, goods trains, and motor vehicles.

And so the space that a network or a line serves and creates is important, as is the level of specification that the network supports. Early twenty-first-century developments on the transport of goods and people are part of the same trend. Hyperloop is set to solve traffic congestion between cities, not within them. It is closer, then, to the Channel Tunnel than it is to pneumatic post – in some respects, it is a hybrid, resembling mainline railways, though running on compressed air rather than steam, diesel or electricity. The first such "atmospheric railway" line opened in 1843. Taking passengers from Kingstown to Dalkey in southeast Dublin – a distance of one and three-quarter miles – its vacuum was provided by a 100hp single-cylinder steam engine. While its speed was limited by the need to brake at bends in the line, it could reach speeds of more than 40mph. A retrospective account commented that the line "worked for many months with regularity and safety throughout all the vicissitudes of temperature which occurred." Whether the reporter truly understood the vicissitudes of the Irish weather is something we will never know. After just over 10 years, the line was closed and converted to a broader-gauge track integrated with the rest of the Irish railway network.

As critics, commentators and supporters of the Hyperloop alike have observed, the concept of pressurized capsules traveling in vacuum tubes powered by a combination of motors and air compressors isn't new. What is new is the interest and momentum it has gathered, in large part triggered by a successful PR and fundraising campaign. Elon Musk's Hyperloop Pod competition has so far issued and attracted entries for four calls in January 2017, August 2017 July 2018 and July 2019. The only criteria by which entries are judged is "maximum speed with successful deceleration (ie, without crashing), and all Pods must be self-propelled." Engineering student teams from the Technical Universities of Delft and Munich and the Massachusetts Institute of Technology have taken most of the accolades so far.

Hardt Hyperloop, the Dutch spin-off winners of the first 2017 Pod competition, are working toward the first European Hyperloop route. Its website asks us to "imagine a world where distance does not matter," where a solar-powered, emission-free "network of cross-border cities, all connected in one network" can take us from Amsterdam to Paris, say, in 38 minutes. Among their partners the website lists the Dutch railways, DHL, Danfoss, Strukton, Tata Steel, and, of course, TU Delft itself. Hyperloop One, in turn, founded in 2014 by Josh Siegel and Shervin Pishevar, has all the ingredients of the start-up story – a whiteboard in a garage in Los Angeles, an innovation campus in LA's art district, a test site in the desert near North Las Vegas. Building on the momentum and global reach of the calls – which extend as far as India and Saudi Arabia – a number of feasibility studies are currently in the making, including in Colorado, where Hyperloop and the Department of Transportation entered a public-private partnership, supported by AECOM. Virgin Group became a partner in October 2017; Richard Branson was named chairman by the end of that year.

If Hyperloop is the Answer, What is the Question?

To many at the turn of the twentieth century, compressed air was the "modern Atlas' of industrial civilization, the titan that would carry the weight of progress in the century ahead (Dikeç and López Galviz, 2016). As we know, that role was taken first by electricity and then by nuclear power. However, the analogy between Greek mythology and contemporary developments in technology is useful in another respect. Atlas was condemned to stand at the ends of the earth, holding the heavens aloft for all eternity, in retribution for rebelling against Zeus. Jacopo Tintoretto's rendering of Atlas, one of many produced by Italian artists in the sixteenth and seventeenth centuries, captures most eloquently the effect this punishment had on the body of the titan, namely, how much of his own anatomy was transformed by carrying the weight of the celestial sphere. The fact that it does not show the sphere makes it all the more compelling: the titan's anatomy is shaped by that which he carries, whether it is there or not. It is a body shaped by what is absent.

Extending this metaphor, we could replace the celestial sphere with the heavenly promises of future transportation and ask, what would be the effect of imposing the Hyperloop on the body of Los Angeles, San Francisco, London, or Edinburgh? Should its promise – both what it highlights and what it leaves unsaid – shape any one city? And, if so, at what cost?

The growth of cities, the mobility of goods and people, and the emergence and development of networks are all interdependent. As the population of a city grows, new networks are needed: roads and ways for transport; waterpipes connected to reservoirs and treatment plants for both potable and wastewater; lines of communication first through the post, the telegraph, the telephone, and, more recently, the internet; conduits for energy and motive power for houses and businesses, for running a range of appliances as well as keeping them cool or heated. At the same time, the size of cities expands and contracts according to the networks of which they form a part, regionally, but also nationally and globally. Undergrounds have been a central part of – and have played a decisive role in – this dynamic for centuries, in some cases millennia. As things stand in the early part of the twenty-first century, far from receding, their role is becoming ever more essential for cities to function.

Whether Hyperloop will prove its worth and develop as a collection of lines or as a network connecting cities has yet to be seen. A recent exhibition at the Victoria and Albert Museum in London, "The Future Starts Here," asked its visitors "If Mars is the answer, what is the question?." The Eddington Transport Study (2006) raised the very same question in relation to HS2, the new high-speed railway line in the UK, which is due to reinforce connections between London and the West Midlands, increasing capacity, frequency, and, of course, speed. The need that Hyperloop is set to meet and the spaces that it will generate and connect are still in the making. At the same time, the infrastructure it requires is not the kind that might be redeployed for a different use. What solution Hyperloop provides is contingent and entirely dependent on trends that we know will change over time. Will people continue to travel between San Francisco and Los Angeles in 20 or 50 years? Will inter-city mobility increase in the future? Will citizens have a say in the process of envisioning what their everyday patterns of travel or behavior might be in 2040 or 2070? We know well where the sights of Musk and Branson are set: toward space. Are we all prepared to become modern Atlases? If Hyperloop is their vision, what is ours?