

THE INVENTIONS OF ALFRED ELY BEACH.

The biography of Alfred Ely Beach which appeared in our last issue described the busy life of one who figured as an inventor, engineer, and editor, filling each role with equal credit. To those who knew him, to those who have benefited by his work in the editorial chair, and to the younger generation who have the world's work pressing more and more heavily upon them, a description of some of his inventions will be welcome and inspiring.

We have stated that as an inventor he committed the error of being two decades ahead of his generation, and when we go back to the old records of his work, it is interesting to see how much he did years ago in the fields of mechanics and of engineering which only to-day is being adequately used and exploited.

Mr. Beach is widely known as one of the early inventors of a typewriter, and his machine of forty years ago shows many of the points of the present accepted type of instrument, notably the basket or pot arrangement of the type rods. His idea in producing this machine was to enable the blind to print works and communications in embossed letters for their own use. This gave him a very difficult problem to solve, that of causing a male and a female die to meet accurately with the paper between them, so as to emboss letters thereon on the same plan as that followed for notary seals. A great point is made about the alignment of the modern

be able to collect by machinery the letters from the mail boxes of the city. He proposed to establish underground a system of pneumatic tubes, traversed by cars which would fit the tubes with comparative tightness and through these tubes he proposed to drive the cars by the pressure of air urged by blowers. The idea to-day is so feasible that it really seems as if there was nothing to stop its successful application.

Mr. Beach proposed the widest possible extension of this system, and it is quite within the probabilities that some analogous process of collecting the mails may yet be adopted in this city to do away with our present slow method.

We present in these illustrations, made years ago under his own direct supervision, the system so clearly that but little description is needed.

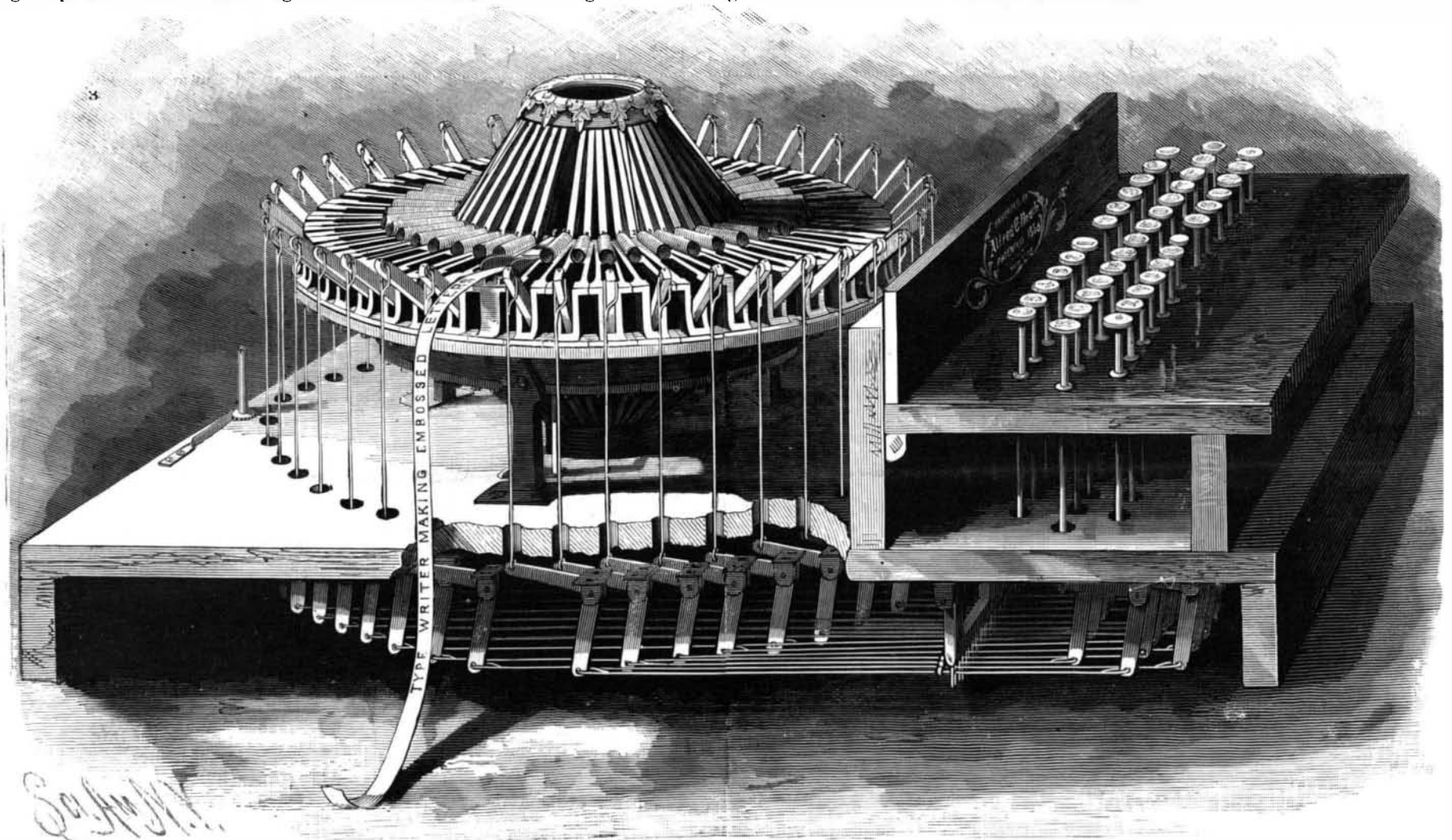
The letters and packages were to be delivered to cars from revolving hoppers whose revolution was effected by pins on the edges of the cars striking the vanes. In one of the cuts the official is shown distributing letters into the hoppers, which transfer them to compartments in the car below. By removing the striking pins a car could be sent through without making collections. Delivery was effected by tripping the hinged bottom of the car, also by a striking pin. To receive cars coming out of the tubes, air cushions were provided.

A receiving and delivering station is shown under

were to be of wood. On one side of the street the elevated way is carried on columns, on the other it is supported by brackets attached to the wall of the building. Here we have one of the first presentations of an electric road erected on the lines of the present structures. It is curious to note that the first of the New York elevated roads was carried by a single row of columns central to the track, just as shown in this old illustration of the Beach elevated road.

These illustrations of the pneumatic system with descriptions were published as early as 1867, the year of the public exhibition of the system at the fair of the American Institute.

We have seen that Mr. Beach was not content to stop at pneumatic transportation on the small scale demanded by the conveyance of letters, and that he conceived the bold idea of extending the invention to the transportation of people, believing that it was practicable to construct a large tube and to blow cars through it at high speed, the cars carrying passengers or merchandise. Visitors to the American Institute Fair, held in the old Fourteenth Street Armory, in the city, in 1867, will remember the pneumatic railroad suspended from the roof and running from Fourteenth to Fifteenth Streets, which is shown in one of our cuts. During the progress of the fair this railroad was kept in constant operation, and carried, it is safe to say, thousands of people.



THE ORIGINAL TYPEWRITING MACHINE, FOR WHICH THE GOLD MEDAL OF THE AMERICAN INSTITUTE WAS AWARDED IN 1856.

typewriter, but the problem of securing correct alignment is simple compared to that of making the two embossing dies of the Beach typewriter meet with requisite accuracy. We illustrate the original Beach typewriter, and would call our readers' attention in its construction to the features since developed and used in the modern typewriter. In the center we have the familiar "pot" or "basket" formed by the type rods. The lower set of type bars in action have one by one their ends carrying one kind of die thrown up, and simultaneously the corresponding die of the upper set is thrown down, and the two by mutual impact, like two fingers, emboss the paper as it is fed between them.

This machine dates back to 1856 and has been aptly characterized in the history of the typewriter as "the first device of any sort in the way of positive improvement." As a mechanical movement the action of the two sets of type bars is very interesting. A fuller account will be found in our SUPPLEMENT No. 574. While 1856 is the date of the public exhibition of this machine, Mr. Beach had attacked the problem in 1847, producing then a typewriter embodying many of the principles of the machine of to-day.

The subject of street car traction occupied him next, and thirty years ago he invented cable traction systems. During the last years of his life the constant passage of the Broadway cable cars in front of the offices of the SCIENTIFIC AMERICAN showed him in some sense the fruition of his early work.

Our next illustration shows some features of the pneumatic mail system, by which Mr. Beach hoped to

the old Lovejoy's Hotel on Park Row. The tube is seen crossing the basement near its ceiling. Six receiving hoppers lead into it from the first or ground floor, and a delivery hopper projects from its bottom. Instead of lamp post boxes, hoppers were provided, automatic in operation, whence letters were collected by the passing cars.

Subsequently, in 1870, he built, in the basement of the building at 260 Broadway, a section of iron pipe eight inches in diameter and about a thousand feet long, which was highly glazed inside to form a perfectly smooth surface. One end of the pipe terminated in a large box, from which a second pipe led to the exhaust pipe. As the air was exhausted from the box, a strong current was carried through the pipe. If a letter or small piece of paper was dropped into the pipe, the current of air carried it freely and certainly to the receiving box. This was made very large, and, as there was no current there, the letters would invariably drop to the bottom, and, by a system of double doors, were easily removed. The simplicity of the idea was its noteworthy feature. Hundreds of experiments were tried, resulting successfully in the transmission of the letters.

Mr. Beach also designed an endless canvas trough to be carried along like the present cable system through a tube under street lamp posts, and thereby become a continuous means of communication from the street post to the post office.

Another interesting illustration shows the pneumatic system applied to an elevated railway. The tubes

The tube, $1\frac{1}{2}$ inches thick, was made of wood in fifteen layers, glued together. It was 6 feet in diameter and 107 feet long. The car, which was open at the top, could carry ten people. A helix fan, 10 feet in diameter and 12 inches pitch, making 200 revolutions per minute, propelled the cars. The car fitted the tunnel approximately, the windage not being sufficient to interfere noticeably with its action.

The New York Tribune, in outlining the great project of providing the city and environs with pneumatic dispatch tubes for mail, says that "letters might be sent up town as high as Forty-second Street and replies received almost with the speed of telegraphic messages." This describes almost exactly what is now done in Paris, New York and elsewhere, where pneumatic dispatch rivals the telegraph in speed.

The next thing was to try this railroad on a practical scale, and Broadway was selected as the field of operation, where, by the use of the Beach shield, of which more will be said later, a circular tunnel was driven under the street without disturbance of the pavement and without the knowledge of those who daily traversed the ground above the scene of operation. A tunnel some two hundred feet long, circular in section and eight feet in diameter, was made, was equipped with a comfortable car, and in the basement of the building on the corner of Warren Street and Broadway was installed an immense rotary blower. The blower was kept in rotation in one direction always, and by shifting the valves was caused to act alternately as a blower or as an exhaustor, driving the

car back and forth in the tunnel. Electric signals were provided to notify the engineer of the time for changing the valves. An annular space or windage of about an inch existed between the car and tunnel. The curved entrance to the tunnel was built of cast iron plates, the rest was of brick.

Hundreds of trips up and down this experimental line were made by the car, it being proved that the system of tunneling was a complete success and that the direct pneumatic propulsion of a car in such a

similar purposes by means of tubes but a few inches in diameter. In New York, Paris and other cities, a very large development has been given to the pneumatic system for the transmission of special messages, and by using very light cylindrical boxes and restricting the system to the transmission of very light objects, cars have been entirely dispensed with, the friction between the box and tube not being sufficient to prevent the system from operating.

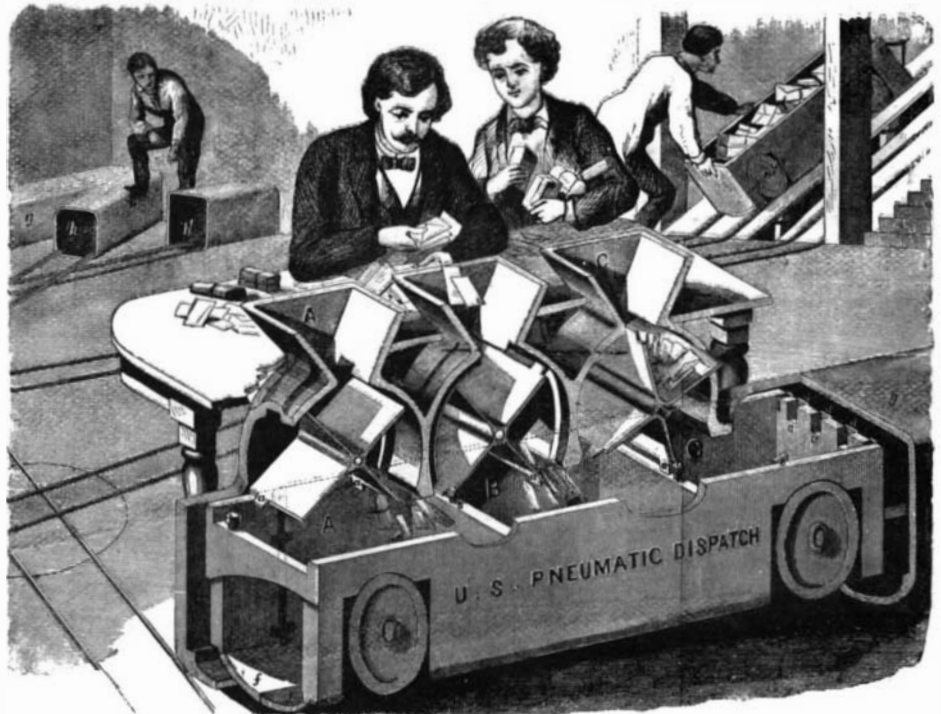
Comparatively few people realize that Broadway is

Close of the Atlanta Exposition.

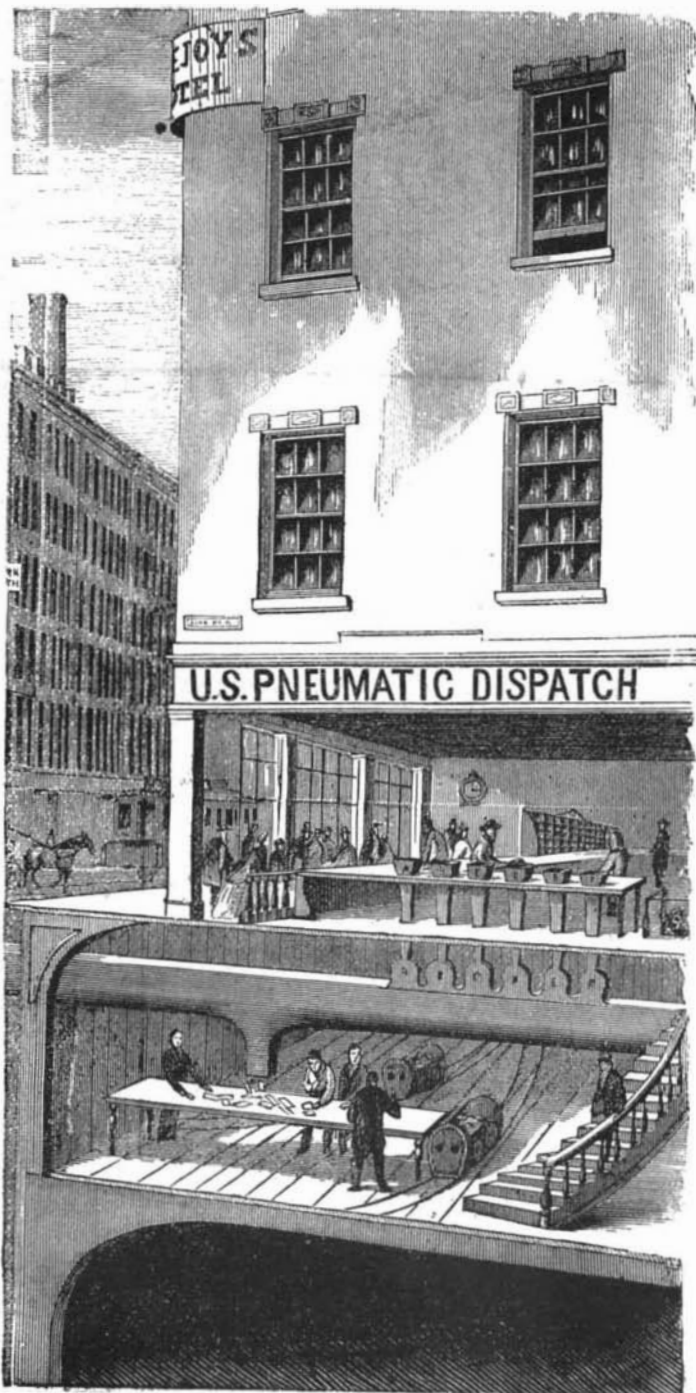
The Atlanta Exposition closed on December 31, 1895, and the exhibits are now being rapidly removed. The chairman of the finance committee states that when all the debts are paid, the exposition will cost about \$200,000, or less than 10 per cent of the money expended on the fair. This includes the original stock subscription and the appropriation of the city. This result is regarded as highly satisfactory. It is estimated that the immediate advantage to Atlanta in



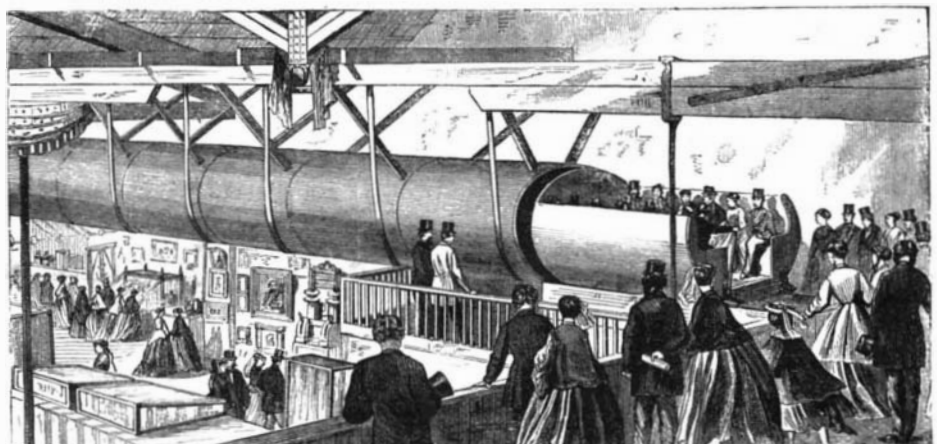
AUTOMATIC POSTAL DELIVERY BOX.



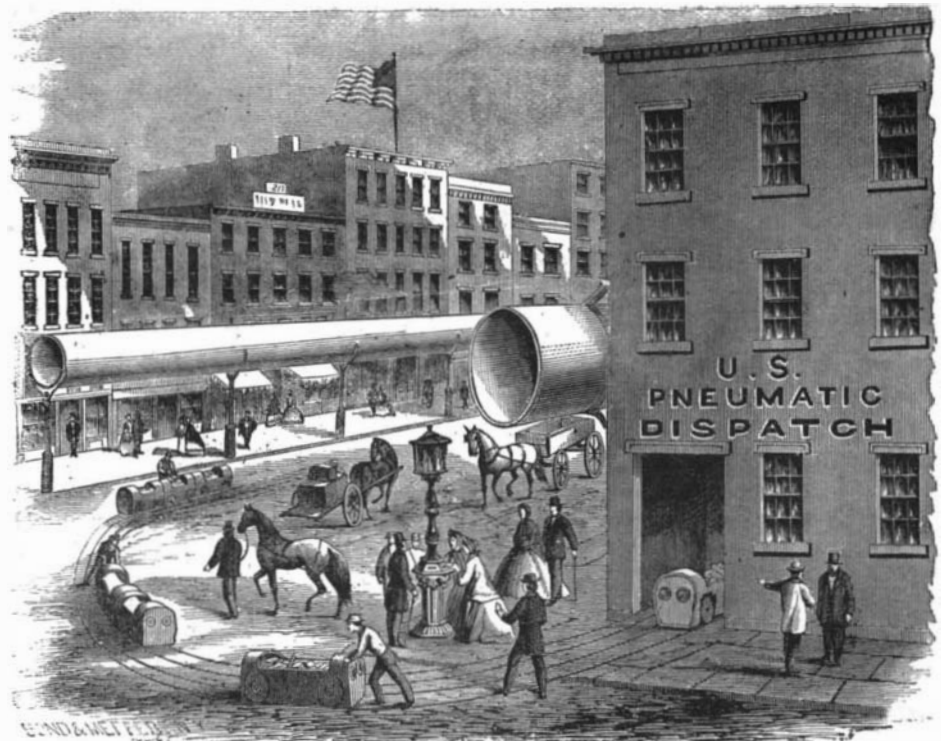
DISPATCHING LETTERS FOR A BRANCH STATION.



RECEIVING AND DELIVERY STATION OF THE PNEUMATIC POSTAL SERVICE.



THE PNEUMATIC RAILWAY AS EXHIBITED AT THE AMERICAN INSTITUTE FAIR IN 1867.



THE PNEUMATIC ELEVATED RAILWAY DESIGNED BY MR. BEACH IN 1867.

tunnel could be practically effected. The system of railroad, however, never reached a more extended development than this.

The tunnel and shield are still there undisturbed for over twenty-five years.

It is curious to note that the enormous development of pneumatic transportation in this and other cities, on the line of Mr. Beach's work, has taken the direction, not of increasing but of diminishing the size of conduit. Stores and cities are now served by pneumatic conveyance for small packages and letters and

now traversed by pneumatic tubes for the sending of telegraphic dispatches. The extensive use of the system in dry goods stores is more familiar.

In Philadelphia the system of the pneumatic dispatch has been very highly developed and applied in the postal service, and the ideas of Mr. Beach can there be seen carried out to their logical development.

TACOMA claims the Pacific coast record for the output of its lumber mills during 1895, the total being about 115,000,000 feet.

the money expended here by the exposition visitors amounts to \$5,000,000, and that the ultimate benefits to the city and cotton States are immeasurably beyond this or any other conservative figure which could be made. Some of the State buildings have been purchased for club houses and other purposes.

New Hampshire Earthquake.

An earthquake of sufficient force to awaken people from sound sleep and shake buildings was felt at Hanover, N. H., at 4 o'clock, January 6.