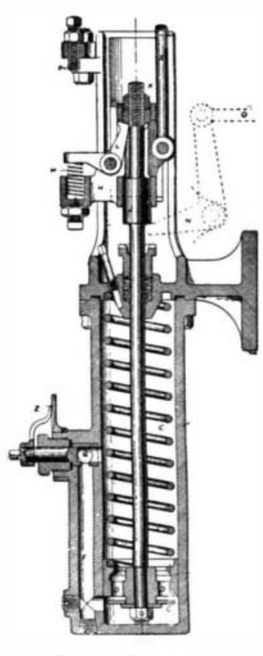
PNEUMATIC MAIL TUBE SYSTEM, NEW YORK CITY.

The transmission of matter through closed tubes by means of a current of air flowing therein is not by any means a novel idea, although its successful application to commercial purposes is of recent date. For the earliest suggestion of pneumatic transmission we must go back to the seventeenth century and search among the records of that venerable institution, the Royal Society of London. Here we find that Denis Papin presented to the society in the year 1667 a paper entitled the "Double Pneumatic Pump." He exhausted the air from a long metal tube, in which was a traveling piston which drew after it a carriage attached to it by means of a cord. At the close of the eighteenth century a certain M. Van Estin propelled a hollow ball containing a package through a tube several hundred feet long by means of a blast of air; the device, however, was regarded more as a toy than a useful invention. Of more practical value were the plans of Medhurst, a London engineer, who published pamphlets in 1810 and 1812 and again in 1832, when he proposed to connect a carriage running inside the tube with a passenger carriage running above it.



6.—TIME LOCK FOR TRANSMITTER.

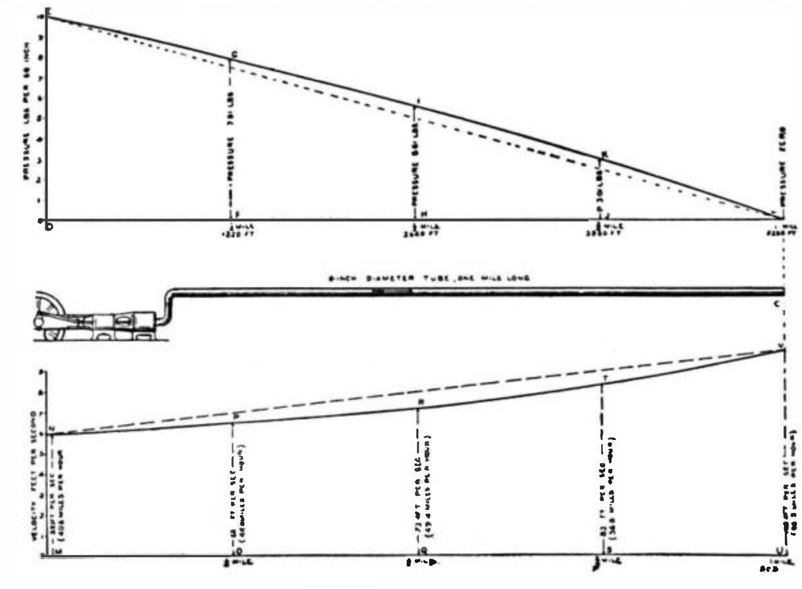
The distinction of being the first city to install a practical pneumatic tube system belongs to London, where in 1853 a 1½ inch tube was laid between Founders' Court and the Stock Exchange, a distance of 220 yards. The carrier was drawn through the tube by creating a vacuum, a steam pump being used for the purpose. The roughness of the interior of the iron tubes gave much trouble, and when subsequent extensions of the system were made in 1858 and later, 2¼ inch lead tubes were used, the carriers being made of gutta percha with an outer lining of felt.

In 1865, Siemens & Halske, of Berlin, laid down in that city a system of pneumatic tubes for the transmission of telegraph messages. The wrought iron tubes, 2½ inches in diameter, were in duplicate, one being used for transmitting and the other for receiving messages. They ran from the telegraph station to the Exchange, a distance of 5,670 feet. The tubes were looped together at the Exchange and a continuous flow of air was maintained by a compressor at one end and an exhauster at the other. The modified system now in use is worked by means of large storage tanks, containing either compressed or rarefied air, and it comprises 38 stations and more than 28 miles of tubing 2·55 inches in diameter.

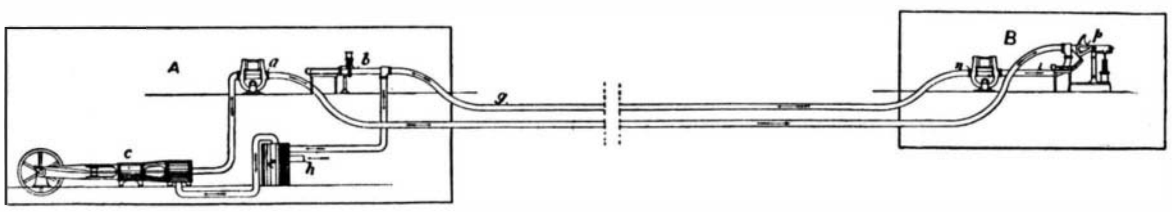
The pneumatic tube system in Paris dates from the same year as that of Berlin. Here a novel feature was introduced in the method of compressing the air, for instead of using a steam engine it was compressed in tanks by displacement with water from the city mains. The tubes of the present system are 2·55 inches diameter, and the carriers are made up in trains of from 6 to 10, with a leather-covered piston at the rear, which fits the tubes snugly and drives them forward. The tubes are of wrought iron and the speed is 15 to 23 miles an hour.

9.—THE BEACH AUTOMATIC POSTAL DELIVERY BOX.

The father of the pneumatic tube system of railways in America was the late Alfred Ely Beach, who for half a century was one of the proprietors of the SCIENTIFIC AMERICAN. His experimental railway was first exhibited at the American Institute Fair held in New York City in 1867. A car capable of seating ten people ran upon a track laid down within a circular wooden tube, which was six feet in diameter and one hundred and seven feet long. The current of air was furnished by a 10 foot helix fan running at 200 revolutions per minute. He then constructed at his own expense an eight foot tunnel, which extended beneath Broadway from the corner of Warren Street to the south side of Murray Street, a distance of 200 feet. The car was propelled by a powerful rotary blower in the basement of an adjoining building, and the car was driven in alternate directions by reversing the valves of the blower. The tunnel is still in existence. Less known but equally meritorious was the system of pneumatic postal tubes designed by Mr. Beach at about the same period. We present two illustrations, Figs. 9 and 10, which were made many years ago under his own direct supervision and need but little description. 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. Delivery was effected by tripping the hinged bottom of the car, this also being done by a striking pin. In 1870, also, he built an 8 inch iron tube a thousand feet long, whose interior was glazed to form a smooth surface. This led to a large receiving box, from which a second pipe led to an exhausting engine. A letter dropped into the pipe at any point was swept along by suction due to the exhaustion of the air from the box, and on reaching the box it fell to the bottom, from which it was easily removed.

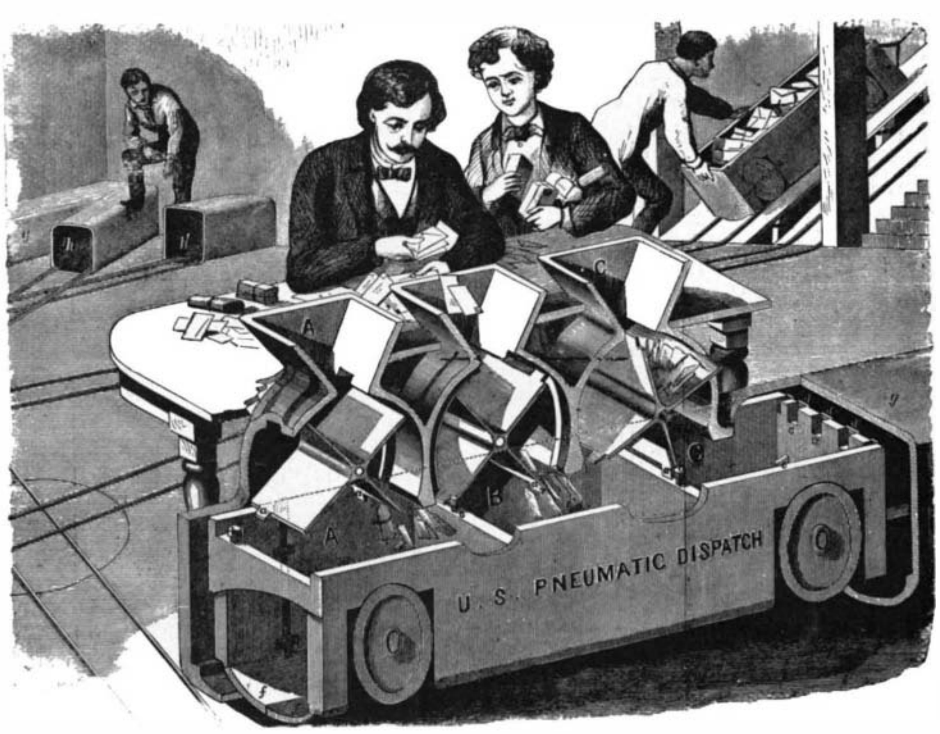


7.—DIAGRAM SHOWING PRESSURE AND VELOCITY CURVES OF AIR IN TUBE.



8.—DIAGRAM OF TWO-STATION ONE-COMPRESSOR LINE.

The London system has grown steadily and now includes 42 stations and 34 miles of tubes. The latter are of cast iron and lined with lead. On the shorter lines the inside diameter is $2\frac{3}{16}$ inches, and on the longer lines 3 inches. The lines are laid out radially, air being compressed at one end and exhausted at the other. Similar systems are used in connection with the telegraph service in Liverpool, Manchester, Birmingham, Glasgow, Dublin and Newcastle. Mention should be made here of the underground pneumatic railways constructed in London, the first built in 1863, 1,800 feet in length and 2 feet 8 inches by 2 feet 8 inches in section; the later tunnels, built in 1872, running from Euston Station to the general post office, a distance of 2¾ miles. The latter was in duplicate and D-shaped in section, measuring 4½ feet wide by 4 feet high, the straight portion being of cast iron and the bends of brick. It was operated by a fan, which forced air into one tunnel and exhausted it from the other. The capacity of the line was about one ton per minute. It was not satisfactory and was ultimately abandoned.



10.—THE BEACH PLAN OF DISPATCHING LETTERS FOR A BRANCH STATION.

The pneumatic tube has been in use in this country on a small scale for a quarter of a century for the transmission of cash in retail stores and for general telegraphic purposes. The Western Union Telegraph Company laid down four lines in 1876 from the main office in Broadway, New York—two to the branch office at 14 Broad Street, one to Pearl Street, and one to the Cotton Exchange. To these it has since added two miles of double line which run beneath Broadway to its uptown office.

The most notable event in the recent history of pneumatic transmission occurred in Philadelphia, when a system of 6 inch tubes was built between the main post office and the sub-post office on Chestnut Street, near Third Street, a distance of 3,000 feet. The reader will observe that in all the European systems none of the tubes are larger than 3 inches in diameter, so that in respect of size alone the Philadelphia plant marked a bold advance upon any existing system, the area of the tubes being increased more than four-fold, and the capacity of the carriers in proportion. The speed, moreover, was nearly doubled, and hence, with the improved mechanical appliances for transmitting and receiving, the capacity of each tube cannot be less than twenty times as great as that in the old country systems. The Philadelphia plant was opened in 1893 and has been in successful operation ever since.

In 1897 the Tubular Dispatch Company, of New York, was authorized to construct a system of postal delivery tubes between the general post office and certain sub-stations in New York City. It was decided to adopt the system already in successful operation in Philadelphia, and to this end the Batcheller Pneumatic Tube Company, of Philadelphia, drew up plans for a set of lines running from the general post office to the Produce Exchange, to the Forty-second Street depot, to One Hundred and Twenty-fifth Street, and across the Brooklyn Bridge to Brooklyn. The line to the Produce Exchange and return was built, and the opening took place on October 7 of this year. The Forty-second Street line is approaching completion, and it is expected that the others will be commenced at an early date.

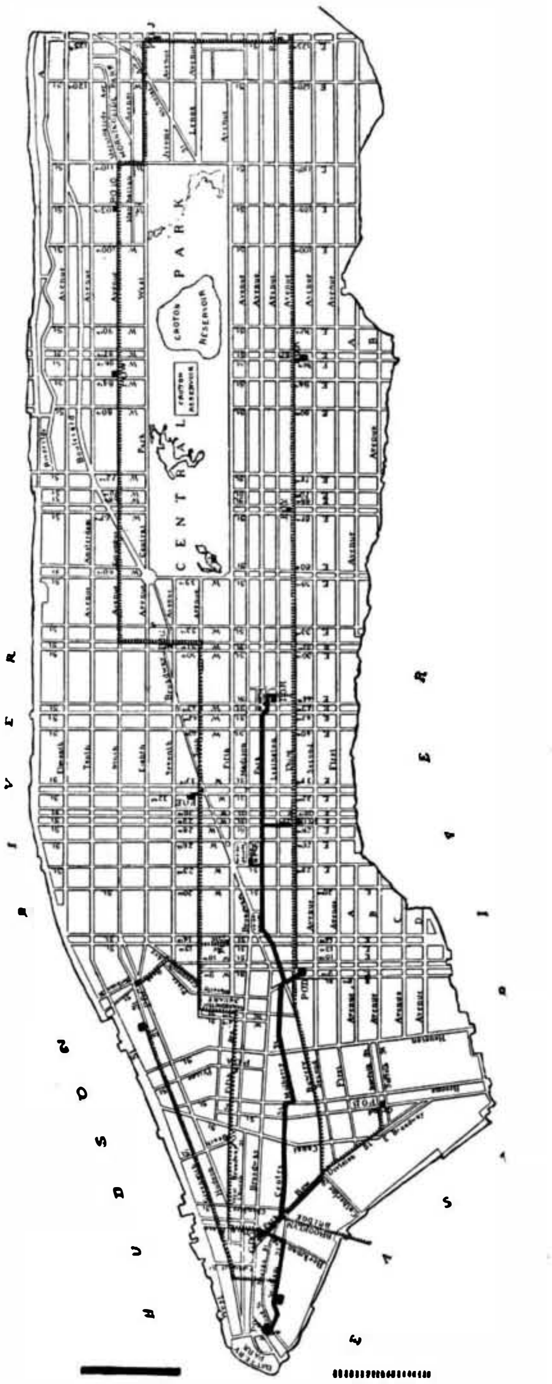
Encouraged by the success of the large tubes adopted on the Philadelphia line, the company determined to make the New York tubes two inches larger, or eight inches in diameter, and to maintain a regular working speed of 30 miles an hour under a headway of 12½ seconds. The capacity of the tubes is thus increased to from 40 to 50 times that of the largest of the tubes in use on the European lines. The two-station branch already completed extends from the general post office to a sub-post office at the Produce Exchange, a distance of 3,750 feet. There are two parallel tubes 8 inches in diameter laid side by side at a distance of from 3 to 8 feet below the street surface. They are connected by a loop at the Exchange, one being used for outgoing and the other for returning mail. Power is furnished by a compressor, C, Fig. 8, at the main station, A, which delivers air at 7 pounds pressure to the square inch to the outgoing tube. The air flows with an increasing velocity and decreasing pressure (the result of its elasticity) to the sub-station, B, at the Produce Exchange, where its pressure is about 3¾ pounds to the inch. From the sub-station it returns by the second tube, as shown by the arrows, to the main station and passes into a receiving tank, E, at which point its pressure has fallen about to that of the atmosphere. The suction of the compressor is connected to this tank and the air is thus caused to circulate continuously through the circuit of tubes.

In order to make use of the current for transmission purposes, a light cylindrical metal shell called a carrier is placed in the tube. It is fitted with two packing rings which prevent the passage of air and cause it to move forward in the tube at the same speed as the current. As the current of air is never interrupted from the time the compressors start in the morning until they are shut down at night, it was necessary to devise some apparatus by which the carriers could be placed in the tubes or removed from them at the start or finish of their journey without interrupting the flow of air. This is accomplished by a transmitter, a, Fig. 8, and a receiver, b, at the main station and another transmitter, n, and receiver, p, at the sub-station.

The straight tubes are made of cast iron, carefully bored and reamed to a smooth finish. The bends, none of which are less than 8 foot radius, are made of seamless brass tubing, 8⅜ inches internal diameter. The carriers are made of a plate of sheet steel, $\frac{1}{32}$ of an inch in thickness, which is rolled into a cylinder, riveted and soldered. The front cover is dished to receive a filling of felt, which is covered with thick leather and forms a buffer to cushion the shocks to which the carrier is liable. The shell is 7 inches diameter by 2 feet long and it is kept from direct contact with the tubes by two bearing rings, one near each end, made of a fibrous woven material. These act as packing and afford a satisfactory sliding contact with the tubes. Their life is limited to about 1,000 miles. The carrier is closed by a hinged cover at the rear, which is locked by three radial bolts. The latter are driven into three holes in the shell by means of a rotating latch operating a cam attached to the cover. The cam is placed eccentrically on the cover, and when the latch is in place locking the bolts it clears the edge of the carrier. As the throwing over of the latch in unlocking the bolts causes the former to project several inches beyond the cover and in contact with the tubes, it will be seen that the carrier cannot become unlocked while it is in transit.

The carrier is introduced into the tube by means of transmitters, a, n, Figs. 2 and 8. The transmitter can best be described by supposing that a section long enough to inclose a carrier were sawed out of the main tube and hung from an overhead shaft, E, Fig. 2, parallel to the tube, in such a way that it could be swung away from the main tube to receive the carrier, and then swung back into line where the current of air could act upon the carrier and force it into the main tube. The ends of the movable section are planed and finished off perfectly smooth and square, so that no air can escape at the joints. When the movable section is swung out of line, two laterally projecting plates move across the ends of the main tube and prevent the escape of air, the current meanwhile traveling round the opening by means of a by-pass. The movements of the swinging section are controlled by an inclined pneumatic cylinder, C, whose valve is operated by a small hand lever, B. In the normal position, when the transmitter is not in use, the movable tube is drawn over opposite a loading tray, and the current passes through the U-shaped by-pass, T, which forms the legs of the carrier. When a carrier is to be sent it is placed on the tray and pushed into the swinging tube. The operator then pulls over the hand lever, B, thereby compressing a spring, which serves to push over the slide valve that operates the pneumatic cylinder. The slide valve may be prevented from moving, however, by a time lock, A, which releases the former twelve and one-half seconds after a carrier has been dispatched. The time lock (which insures a proper headway between successive carriers in the tube) is shown to the left of the pneumatic cylinder in Fig. 2 and in larger detail in Fig. 6. It consists of an oil cylinder, C, in which is a piston that is normally kept at the bottom of its stroke by a coiled spring. When the starting lever is pulled over, the time lock piston is drawn up against the spring, which at once begins to force the piston back, driving the oil around a by-pass valve, G, the time of its descent being regulated by the degree to which G is opened. At the bottom of its stroke an offset on the piston rod, J, pulls down a bell crank, N, which, by means of a connecting rod, O, withdraws the locking bolt, L, on the valve of the pneumatic cylinder and permits the latter to throw the transmitter into line.

The carrier is impelled into the main tube and carried to the sub-station. As the air pressure at this point is 3¾ pounds to the square inch, it is impossible to open the tube for the purpose of removing the carriers. Moreover, as they arrive at a speed of 30 miles an hour, some provision has to be made for gradually checking their speed. These two results are obtained by means of the closed receiver, Fig. 4, which consists, like the transmitter already described, of a movable section of 8 inch tube. It is about double the length



Constructed Proposed.

11.—PRESENT AND PROPOSED POSTAL TUBE LINES IN NEW YORK CITY.

of a carrier, and is hung upon trunnions in much the same way as a telescope, the trunnions being placed midway of its length. In its normal position, as shown in Fig. 4, it forms a continuation of the tube by which the carrier arrives, and as the latter is impelled into the receiver, it compresses the air in front of it and is brought to rest without any harmful shock. Just in front of the receiver the main tube is provided with a number of slots, A, which by-pass the air into a tube which leads through the sub-station transmitter, n, Fig. 8, back to the main station. The compression of the air in the receiver by the entrance of the carrier opens a relief valve at the rear end, and so prevents the carrier from being thrown back into the main tube. The pneumatic cylinder, D, elevates the outer end of the receiver and tilts the latter on its trunnions, for the purpose of discharging the carrier on to the receiving table. This is accomplished automatically as follows: A small portion of the air compressed in the receiving chamber flows through a small pipe to a piston which controls the slide-valve of the tilting cylinder, D. The piston pushes down the piston slide-valve and admits air to cylinder, D, whose piston rises and by means of a connecting rod tilts the receiving chamber to an angle of 40 degrees. The carrier slides out an inclined and pivoted platform, E, which is kept in the inclined position by a counterweight. The weight of the carrier overbalancing the counterweight, the platform falls to a horizontal position and delivers the carrier onto a table in front of the operator, as shown in Fig. 5. An ingenious arrangement of bell cranks and rods connects the platform, E, with the slide valve of cylinder, D, so that the return of the former to the inclined position causes the cylinder to return the receiving chamber, B, to its normal horizontal position ready to receive the next carrier. Above the front end of the receiving chamber is a plate, P, carefully turned to the radius of the arc described by the chamber on its trunnions, which closes the end of the main tube when the chamber is in the tilted position. The interval from the arrival of a carrier to the return of the receiving chamber to the horizontal position is only 3 or 4 seconds.

The transmitter, n, at the sub-station is similar to that at the main station, already described. The receiver at the main station, however, is entirely different from the one just described. Its construction is shown in detail in Fig. 1. The carrier arrives by the curved tube and passes into a receiving chamber, which is simply a section of tube closed by a vertical sluice gate. The current of air, now expanded to atmospheric pressure, passes from the main tube down a vertical pipe to the return tank, e, Fig. 8, in the basement. The distance from the slots through which the air passes to the tank, to the sluice gate, is about 4 feet, and the momentum of the carrier is absorbed in compressing the air ahead of the car as it enters this chamber. Part of this compressed air passes up through a small pipe, as indicated by arrows in Fig. 1, and enters a small cylinder, where it depresses a piston which is normally held at the top of its cylinder by a coiled spring. This cylinder is situated just above the piston slide-valve of a pneumatic cylinder, whose work is to raise and lower the sluice gate above mentioned. The depression of the small piston and the attached piston valve admits air at 7 pounds pressure below the piston of the pneumatic cylinder and raises the sluice gate, to which it is attached. The very slight pressure of the air behind the carrier is sufficient to force it out onto the receiving table. As the carrier passes out it strikes a small trip-finger, which moves the piston slide-valve back to normal position and shuts the gate. If the air pressure in the main tube is not sufficient to expel the carrier from the receiver, the vertical pipe that conducts the air current to the return tank is partially closed by means of the gate valve shown in Fig. 1.

The diagram, Fig. 11, is inserted to show the principles of the system of pneumatic transmission above described. Air at say 10 pounds pressure is supposed to be constantly supplied at one end of an 8 inch tube one mile in length, the pressure falling until it leaves the other end at zero. The air being elastic it expands as it flows, and this expansion necessarily increases its velocity. The decrease in pressure and the increase in velocity are shown respectively by the curved lines in the upper and lower diagrams.

The accompanying map of a part of New York City shows the present and proposed lines of tubes contemplated by the Tubular Dispatch Company. The full black line indicates the lines already either completed or practically completed, and the dotted lines mark the proposed extensions.

For the drawings and data used in our description of this extremely interesting plant we are indebted to Mr. B. C. Batcheller, chief engineer of the Pneumatic Tube Company, who is the inventor of the salient features of the system.

A Word to Mail Subscribers.

At the end of every year a great many subscriptions to the various SCIENTIFIC AMERICAN publications expire.

The bills for 1898 for the SCIENTIFIC AMERICAN, the SCIENTIFIC AMERICAN SUPPLEMENT, and the ARCHITECT'S AND BUILDER'S EDITION of the SCIENTIFIC AMERICAN are now being mailed to those whose subscriptions come to an end with the year. Responding promptly to the invitation to renew saves removing the name from our subscription books, and secures without interruption the reception of the paper by the subscriber.

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Science Notes.

Salts of cinnamic acid have been used as a remedy for tuberculosis on four hundred patients of Prof. Landerer, of Stuttgart. From an experience of seven years he hopes that he has found a lasting cure for the disease.

A novel use of the kinematograph is reported from Germany, where the instrument was recently used to secure a series of pictures representing all the movements of the hull made during the launching of a vessel. The instrument selected for the purpose was the Messter-Betz biograph, said to be capable of recording four thousand impressions a minute. The German naval officials are said to take considerable interest in the experiment, and no doubt it is capable of useful extension.

According to a writer in Les Nouveaux Remèdes, black eggs are not uncommon from ducks, who are extremely found of acorns. The coloring matter of their egg-shells is rich in iron. The resulting combination of tannin and iron is stated to result in black eggs. According to the same authority, bright red eggs may be obtained from fowls by feeding them with lobster shells (presumably boiled). We cannot state the original source of these statements, but they bear obvious evidence of transatlantic origin.

The tremendous force of the sea was illustrated by an object lesson ashore in New York City recently, when five large tanks, built to contain 120,000 pounds of soap, but which were temporarily filled with water and situated on the fourth floor of a large building on West Fifty-second Street, collapsed, and completely wrecked the whole building, killing three men and doing a large amount of damage. The tanks were each 15 feet high and about 13 feet diameter, and contained 161,703 pounds of water, but the floors and supporting beams proved altogether inadequate to stand the strain. A wave of the dimensions of one of these tanks is not at all unusual at sea, and when such a wave breaks on a vessel's deck the force of the blow can only be estimated by the amount of damage it does, in spite of the elasticity of the water beneath the vessel to ease her in receiving the shock.

The London Times prints the following dispatches received from its correspondent at Melbourne, October 3: "The scientific expedition which was dispatched to the Ellice Islands by the Sydney Geographical Society, under Prof. David, has confirmed Darwin's theory of the formation of coral islands. Prof. David reports from Samoa that the expedition has been a decided success. The diamond drill went down 557 feet in the coral without reaching the bottom." October 4: "With reference to the borings on the Ellice Islands to obtain information as to the formation of coral islands, Prof. David states that the results to 487 feet were inconclusive. Beyond that they strongly favor Darwin's theory, though a final judgment depends upon microscopic examination of the drill cores. The borings are being continued." The expedition was under the auspices of the Royal Geographical Society of Australasia, and was directed by Prof. T. W. E. David, of Sydney. In view of the difficulties previously met with at Funafuti, a special boring plant was provided weighing over 25 tons, and capable of boring to a depth of 1,000 feet. It is understood, says Nature, that the core obtained will be forwarded first to the Royal Society, of London, which will return one-half to the Royal Geographical Society of Australasia.

The German expedition to the Pacific under Prof. Schauensfeld, director of the Bremen Museum of Natural Science, Ethnology, and Commerce, has produced so rich a yield that it will take a long time to prepare and arrange the material brought home, says the English Mechanic. The voyage lasted fourteen months. The professor's labors in the remote little island of Laysan, in the Pacific, were rewarded with the best results. He had splendid opportunities of observing the habits of the birds frequenting the island. Of the six species that are endemic, he collected specimens in all stages of development; he brought home several hundred birds' skins and whole nests with stuffed birds sitting in them. He obtained several turtles at Laysan, and succeeded in hatching the eggs. Sharks and thornbacks were caught. A collection was made of the flora of the island, which includes the piece of a trunk of an extinct species of palm. The fauna and flora of the sea offered a wide field of investigation, and highly interesting forms of coral are among the specimens that have been secured. Lava and various kinds of stone from the Sandwich Islands, splendid corals from Samoa, and the specimens from New Zealand and Chatham Island form an important part of the collection. The skeleton of a native belonging to a tribe that will before long become extinct is among the acquisitions. Prof. Schauensfeld regards the finding of a kind of lizard called Hatteria [Rhynchocephalus] as a special piece of good fortune. It is stated that it is impossible to give a "complete survey of the rich mass of scientific work that was carried out in the course of this voyage," but it is hinted that the professor himself will give an account, in spite of its impossibility.

The Cult of Fear.

On the subject of infantry fire, there is the danger that, in training men to seek protection, they are being trained to hide themselves, and that the military spirit of the offensive is apt to be destroyed. It is the right and duty of the officer to take account of losses, and to diminish them as much as possible, by utilizing the ground. But he must never be dominated by the fear of loss to the forgetting of the great fruits of success. Undoubtedly the training in the use of ground should be wholly eliminated from the education of the soldier, in so far as it relates to his personal security during the attack, or, as the regulations say, for the attenuation of the effect of the enemy's fire. Changes in armament have not changed human nature, and there can be little doubt but that men will be only too willing to seek protection for themselves, without being specially trained in the art of finding it. It is for the leader to decide if the conformation of the ground is favorable and admits hope of success, but, when the order to advance has been given, the man has no right to think of whether he shall go forward or not, or whether he shall find protection or not; above all things, he must go forward. We do not oppose the spirit of the German regulations, and would not habituate troops to despise the protective value of the ground they pass over; but it must be taught to them not as individuals, but as troops in the field, always under the order of their officers as to whether they shall seek its protection or not. "Let us expel from our ranks this cult of protection and fear of loss; they can only have destructive influence upon the boldness of the troops and the spirit of the offensive in them."—Militär-Wochenblatt.

A LOW PRICED GRAPHOPHONE.

The illustration represents a graphophone of very simple construction, which embodies the essential features of the high-priced machines, but which is placed on the market at a greatly reduced price, by Messrs. Hawthorne & Sheble, of 604–606 Chestnut Street, Philadelphia, Pa. It is run by a clockwork spring motor, wound by the thumb piece shown at the left in the engraving, and the same instrumental and vocal records are used on it as on the high-priced phonographs and graphophones. The reproduction of sound is, as is well understood, caused by the vibration of a diaphragm opposite the small end of the horn or trumpet, such vibration being caused by a jewel point connected with the diaphragm and which passes over the wax cylinder at the right, the surface of the cylinder having been previously indented by a like process, when a sharp cutting point has been passed over the cylinder, to indent or mark it in accordance with the sounds vibrating the diaphragm.

THE "EAGLE" GRAPHOPHONE.

Number of Naval Vessels.

Chief Constructor Hichborn, in order to settle differences of opinion that frequently occur on the subject, has issued the following official summary showing the number of vessels in the United States Navy: First-class battle-ships, 9; second-class battle-ships, 2; armored cruisers, 2; armored double-turreted monitors, 6; single-turreted monitors, 13; protected cruisers, 13; unprotected cruisers, 3; gunboats, 10; composite gunboats, 6; special class, 3; steel torpedo boats, 22; wood torpedo boat, 1; iron cruising vessels, 5; wooden cruising vessels, 11; sailing vessels, 6; tugs, 14; wooden steam vessels unfit for service, 8; wooden sailing vessels unfit for service, 6; total, 141.

A Hint to Manufacturers and Merchants.

The importance of registering trade marks at the Patent Office does not seem to be sufficiently realized by manufacturers and merchants in this country or abroad. Persons adopting a word, phrase or emblem to distinguish their specialty of manufacture, whether it be on dry goods, groceries, food products or preparations of any kind, will derive more benefit by registering them than many seem to realize. Full information as to the necessary procedure to obtain trade mark protection may be had by communicating with this office.

Recent Archæological News.

The total value of the collection left to the Institute of France by the late Duc d'Aumale is estimated by experts to be worth $3,000,000.

François Aurèle Pulsky, the archæologist, died recently at Buda-Pesth. He was the author of a work on the age of brass in Hungary.

Prof. Dr. Wilhelm Dörpfeld writes to the Times from Athens to answer the question, "Is the Parthenon doomed?" He says that the war cut off the Greek Archæological Society's large revenue from the state lottery. Repairs, therefore, have been interrupted and no one knows when they will be resumed. For the Parthenon, this is deplorable. The consequences would be most serious should an earthquake shake the mountain rock.

A preliminary report has reached London from Rome of the results of Captain Bottego's expedition in northeast Africa, says The Evening Post. They establish the identity of the Nianam River, flowing into the northern end of Lake Rudolf, with the mysterious river Omo, which so long has puzzled geographers. The river now has been renamed Omo Bottego. To the east of this river and north of the beautiful Lake Abbaye a much larger lake has been discovered, which has been named Regina Margherita.

On a stone of the temple of "Wingless Victory," on the Acropolis, at Athens, an inscription has been found stating that the monument was built by Kallicrates, who was one of the architects of the Parthenon at the beginning of Pericles' government. This fixes its date at about four hundred and fifty years before Christ. The Athens Archæological Society is about to undertake the restoration and strengthening of the Parthenon. Marble from Pentelicos will be furnished free for this by the company working the quarries.

Hollow wedge bricks were used by the Romans for constructing arches at their baths at Bath, England. According to The Engineer, the roofs of the dressing rooms were covered in some instances with flat brick arches, and, as these would have fallen in by their own weight if constructed in the ordinary manner, hollow voussoirs were moulded with a semicylindrical projection on one radial side and a semicylindrical cavity to correspond on the other. The bricks were about one foot long from intrados to extrados and ten inches wide on the back. They were finished well, and apparently of fire-burnt ordinary clay.

Signor G. B. Cavalcaselle, who, with the late Sir J. A. Crowe, wrote the well known "History of Painting in Italy" and "History of Painting in North Italy," lives of Raphael, Titian, etc., died recently at the age of seventy-nine years. He had a very romantic career, owing to his ardent liberal views, and at one time he was left for dead at Piacenza. When the French entered Rome he escaped to England by way of Paris. In London he earned a precarious living as an illustrator. He now began his lifelong collaboration with J. A. Crowe. The two writers did much to put art criticism on a sound documentary basis. Many of their appreciations were awkwardly expressed, but, for all that, their works have a very solid value to-day, and combined with the writings of Morelli, they give the student an accurate basis for determining the attributions of disputed old masters.

At Meron, near Angers, the remains of a Roman temple have been discovered. The French peasants are not enthusiastic archæologists, and as soon as the foundations were seen the people of the district lost no time in seeking for treasures. Some coins were discovered, and, as they were rare, the prices obtained for them increased the eagerness for further explorations. Not the least regard was given to the old masonry, from which it would have been feasible to prepare a plan of the temple. Now much will have to be derived from imagination, says the Architect. The conseil général, apprehending additional mischief, has appealed to the administration for interference. After some delay, money has been granted to the departmental commission for the purpose of insuring the safety of any masonry that has survived.

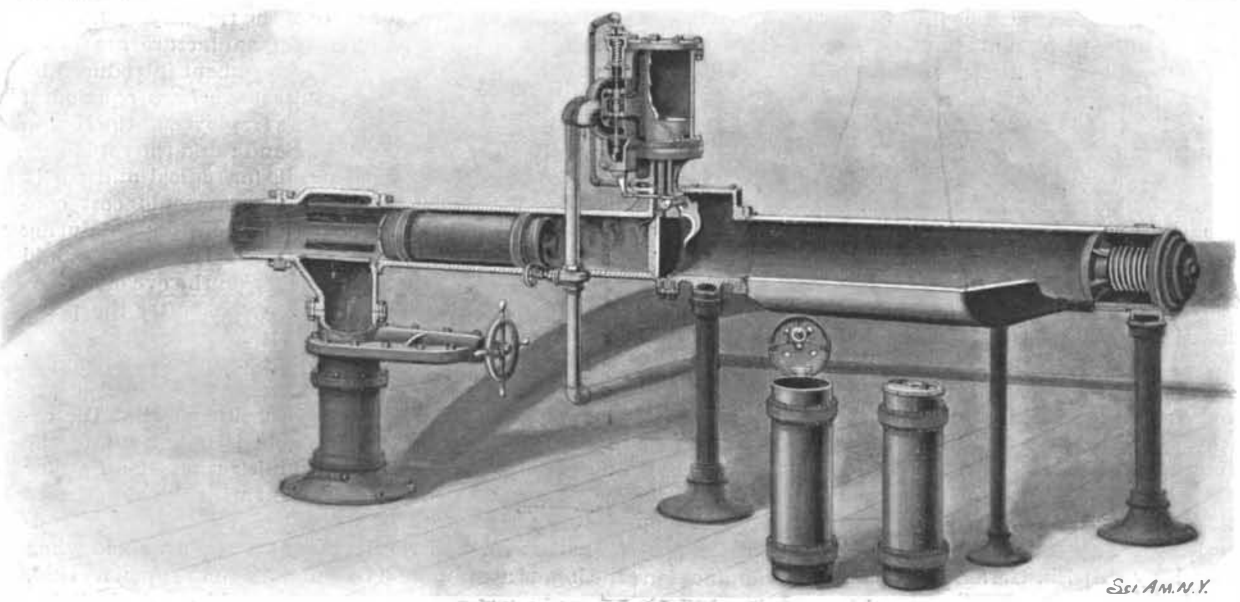
The royal British antiquarian and archæological societies have lodged a petition with Lord Salisbury protesting against the peculiar form of prison labor in Egypt since the Khedive's penitentiaries and jails have been under English management. It seems that the convicts, of whom there are twelve hundred in the Jourah prison alone, are employed in manufacturing bogus antiques, for which there is reported to be a large market, especially in America. The petitioners declare that the forgeries are so clever as to be scarcely distinguishable from the real article. As yet only antiques of relatively small dimensions have been produced, but the prison authorities express the hope of being able in course of time to turn out full-fledged mummies and sarcophagi. The scientific societies in England point out with some degree of justice that while this form of prison labor may have commercial advantages, it practically renders the British government a party to fraud.

SCIENTIFIC AMERICAN

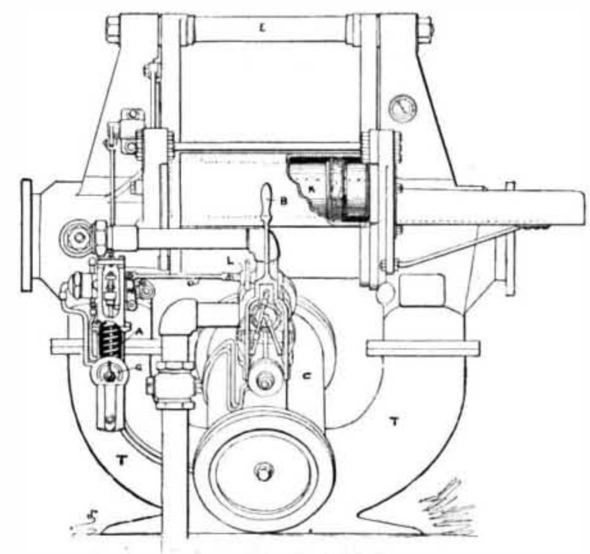
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1897, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

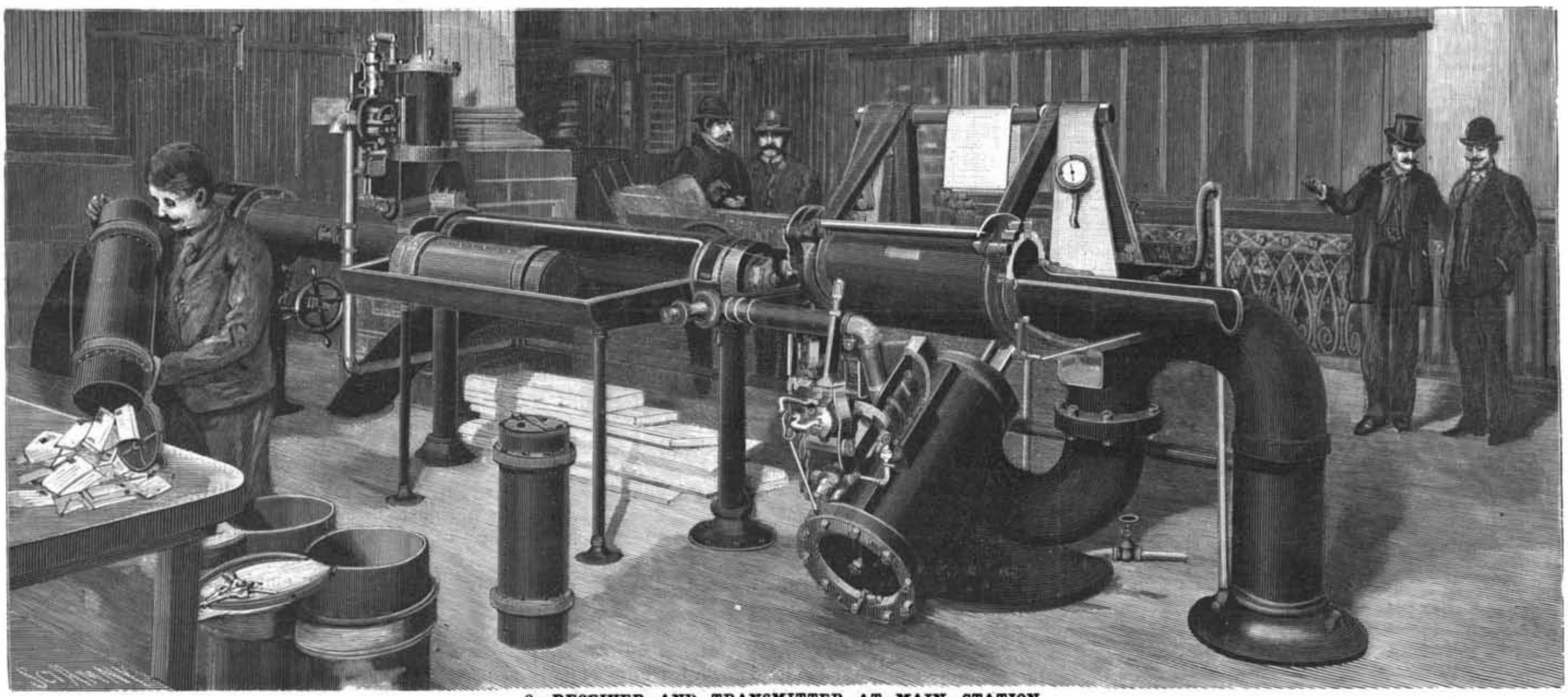
Vol. LXXVII.—No. 24. ESTABLISHED 1845 | NEW YORK, DECEMBER 11, 1897. | [$3.00 A YEAR. WEEKLY.



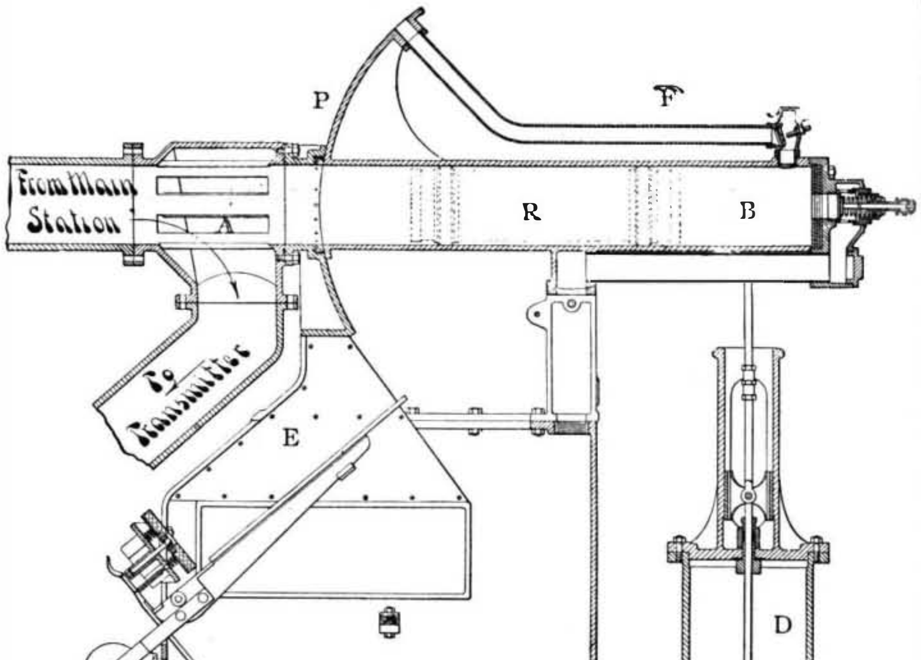
1.—RECEIVER AT MAIN STATION.



2.—A TRANSMITTER.



3.—RECEIVER AND TRANSMITTER AT MAIN STATION.



4.—CLOSED RECEIVER AT SUB-STATION.

5.—REAR VIEW OF CLOSED RECEIVER.

PNEUMATIC MAIL TUBE SYSTEM NEW YORK CITY.—[See page 373.]