THE PNEUMATIC TELEGRAPH LINE AT PARIS.

The line of pneumatic tubing, which was laid as far back as the year 1867, was, on the 1st of January, 1878, 20 5 miles in length, this representing from the beginning an average of 8,830 feet laid per year. Now the total length is 111 miles, to which must be added the 12·5 miles of tubing that secure communication with the centers of power. It includes a double main line, in which terminate 72 secondary ones, with various branches, plus a direct line between the central station and the Bourse.

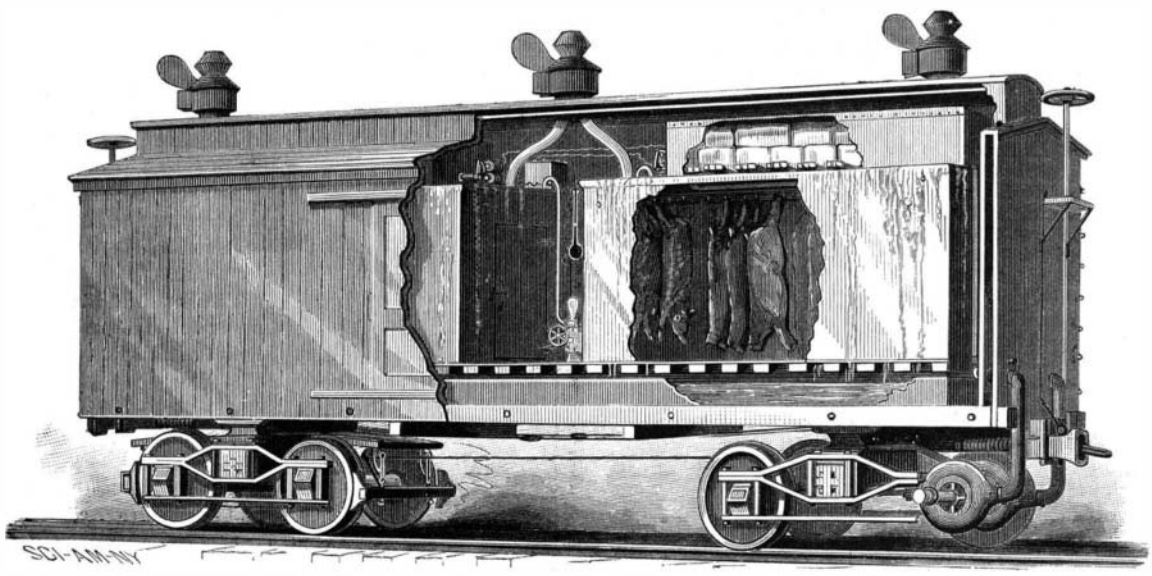
The number of offices that have been opened for the service of the tubes is 75, this including those of the Chamber of Deputies and Senate.

The 111 miles of lines are supplied by 8 stations, having steam engines of a total power of 315 horses, and 4 auxiliary water motors, which can eventually be used in addition. The trains run every three minutes upon the direct line from the central station to the Bourse, every five minutes upon the principal line, and every quarter of an hour only upon the few branches. The lines consists of tubes of 2½ inches internal diameter, that are bored perfectly true, so as to present no projection that might interfere with the running of the boxes. The boxes or travelers move through the tubes under the action of compressed (or rarefied) air produced by special pumps.

After the dispatches have been put into the box, the latter is closed by means of a rubber sheath which almost entirely covers it. The last box of each train carries at its back part a sort of collar formed of a flexible leather ring 3¼ inches in diameter, whose edges, being in contact with the inner surface of the tube, obstruct the latter completely without interfering with the movement of the box. The box thus arranged is called the piston box, and performs the part that a locomotive does on railways, while the simple boxes correspond to cars. There is, however, the difference that when the passengers (*i. e.*, the dispatches) are not numerous the locomotive itself carries them to their destination. Each box is capable of containing twenty dispatches.

The apparatus shown in the engraving serve as stations for the trains, and, as in all stations, there is a starting and an arriving side. The apparatus of the same line are thus grouped in pairs, and, moreover, are exactly alike, so that, if need be, the direction of the train may be reversed. They consist essentially of a vertical tube (in which the line terminates) ending in a square chamber whose anterior face is provided with a door that closes hermetically. It is through this latter that the boxes are introduced and taken out. The curved tubes that are seen here and there upon the central tube of each apparatus serve to connect the line with the vacuum or pressure apparatus by means of cocks that are maneuvered by a small hand wheel. The large collecting tubes placed horizontally communicate through tubing with the reservoirs, in which the play of the pumps is constantly renewing the stock of compressed or rarefied air.

Finally, in case a box that has reached one of the apparatus must start again through the contiguous one without getting a vacuum or pressure from the station itself (which is something that happens in all intermediate offices that are not connected directly with a center of power), it is necessary that the compressed or rarefied air shall be capable of traversing the station in order to drive the train toward the following stations. The two chambers that form the heads of the apparatus are then connected by opening a cock placed upon a connecting tube situated behind. In order to prevent a box that has reached the head of an apparatus from falling into the line, the tubist, as soon as a train arrives (which he knows through the noise of the shock), closes the line by means of a valve maneuvered by a lever that is within his reach. In the annexed figure the three apparatus to the left have their valves closed, that is to say, they are isolated from their lines. The fourth alone is in a position for receiving or sending.



NEW SYSTEM OF PNEUMATIC TUBES AT THE CENTRAL TELEGRAPH OFFICE, PARIS.

The play of the valves is likewise utilized for preventing the compressed or rarefied air that fills the line at the moment of a train's arrival from being lost in the atmosphere when the door of the apparatus is opened.

The figure also shows several indispensable accessories. The pressure gauges indicate at every moment the degree of pressure or vacuum—an attentive examination of the movements of the needle upon the dial clearly showing to an experienced agent any irregularities that may occur in the running of the "piston." A manipulator placed over the door, and an electric bell surmounting the "cap" of the apparatus, serve for exchanging starting and arriving signals.

Finally, a series of iron plate sheaths serve for holding the exchange boxes. The velocity of the boxes varies with the length of the line and the amount of power that determines their motion. Under favorable circumstances, that is to say, upon very short lines, and with a difference of pressure of 40 centimeters of mercury, the velocity may reach six-tenths of a mile per minute.

The entire line will be finished this year, and telegram cards will soon be circulating in all the wards.—*La Nature*

ACCORDING to the theory of F. Siemens, flame is the result of an infinite number of exceedingly minute electrical flashes, which are caused by the swift motion of gaseous particles.

IMPROVED REFRIGERATING CARS.

The object of an invention recently patented by Mr. Henry Tallichet, of Austin, Texas, is to provide an improved system of refrigeration and apparatus for applying the same to practical use. The body of the car has any approved double or packed walls serving as non-conductors of heat, and suitable side doors. The car is fitted with two chill rooms, one near each end, and of a size to afford free air spaces at the sides and ends, the center air space being wider for access to the rooms through their doors. These rooms are jacketed with a porous material, and rest upon a slat floor, beneath which are water tanks in which may be stored water or ice, with the drippings of which the porous jackets are kept saturated by a pump located in the center air space, and having suitable pipe connections for discharging the water on to the top of the rooms. The pump is operated from one of the car axles. The bottom of the tank descends each way to a well formed by a depression, and into which the suction pipe extends. Air is forced into the space between the top of the tank and floor on which the rooms rest by one or more blowers, driven from the car axle, for evaporating the water from the jackets to lower the temperature of the rooms. The water not evaporated flows back into the tank, and as but little escapes, a continuous supply is not needed. To increase the air draught the roof of the car is provided with ventilating fans, and although these may induce sufficiently strong air currents, the blowers are a valuable auxiliary. When the car is not moving the blowers are inoperative, and to guard against a rise in temperature, ice chambers opening near their tops for supply of ice are located over the the chill rooms. The devices described provide for cooling the rooms in every exigency of travel and without recourse to independent motors.

TALLICHET'S IMPROVED REFRIGERATING CAR.

Near the bottom of the ice chamber is placed the central portion of a continuous pipe, having a zigzag construction, which serves as a rack to hold the ice and keep it above the drip water. This portion of the pipe is set in an inclined position, and at one end has a branch passing outward and downward and opening to the outer air, and at the other end has a branch passing down into the chill room. Air enters the pipe, and as it passes through the zigzag part in the ice chamber is deprived of its moisture by condensation, and appears in the chill room in a pure, cool, and dry condition, best suited for purposes of ventilation. The incline of the worm permits of a self-discharge of the condensed vapors. At a point as far removed as possible from the cold air outlet, there is passed into the chill room the open end of a pipe the other end of which opens into the case of one of the exhaust fans at the roof. This pipe acts constantly to exhaust and circulate the air of the chill room, thereby avoiding the deleterious effects of "dead air." An arrangement is provided for reducing the temperature of the chill room by saturating its top and side walls with the cold water drip of the ice chamber; this is accomplished automatically and at any premeditated temperature by an electrical contrivance acting on a valved outlet from the ice chamber. The water escaping from the ice chamber fills a shallow tray formed on the chill room roof by narrow ledges, and flows down the sides of the room, materially reducing the interior temperature.

This apparatus is automatic in action, and uses no chemicals as refrigerating agents. The quantity of ice used is reduced to a minimum, as its effects are required only, or principally, when the other means fail by stoppages of the car.

A Suggestion to Employers.

The Bridgeport (Conn.) *Daily Standard* hits the nail on the head when it recommends a year's subscription of the SCIENTIFIC AMERICAN as the best Christmas present an employer can make his workman, or a father his son. The editor further adds:

"And let any manufacturer try the experiment of asking each man in his employ as to the interest he would take in reading such a periodical if it was placed before him, and he will be surprised at the amount of pleasure and choice information that can be furnished at a small outlay. For every paper thus put in the hands of his employes he would receive four times its value by reason of the increased interest which would be taken in whatever work might be in hand, to say nothing of the benefit which would be directly derived from the enhanced skill of the workmen. The weekly visits of the periodical would constantly remind each man that his employer was concerned in his welfare, and that he had exerted himself to show that interest. We know from personal experience that information gained from the columns of the scientific journal above mentioned is invaluable to the person who is interested in science, art, or natural history, and it would be truly a pleasure to learn that we had induced even one employer to take a step which he would ever afterward be satisfied was a good one."

We await to see how many will follow the good suggestion of our valued contemporary before this month closes. —ED.

Putnam River, Alaska.

The Ounalaska (Lieut. G. M. Stoney, U.S.N., commanding) arrived in San Francisco, October 25, having completed the exploration of Putnam River so far as the time allotted would permit. The river was explored by a steam launch three hundred miles, when rapids were encountered; then a canoe was taken and towed by hand about eighty miles further; and from this point a short portage brought a portion of the party to the head waters of one of the northern tributaries, which was fed by two large lakes. A mountain near one of these lakes furnished a view far to the eastward, up the main valley of Putnam River, and showed it flowing in undiminished volume as far as the eye could reach. The natives reported that seven days' journey further up the river there was a great lake, looking like a sea; and it is thought that this is the source of the river. There is little doubt that the river has its origin as far east as the British possessions, and probably near to the Mackenzie.

Putnam River empties into Hotham Inlet just north of Selawik Lake and to the southeast of Kunatuk River. There is a large delta at its mouth stretching back about forty miles, which is pierced by over one hundred channels, one of which is about one mile in width. The river is navigable to boats drawing from five to six feet of water, up to the rapids. Here the water flows at about ten knots per hour. The river and most of its tributaries lie within the Arctic circle. Most of the tributaries are from the north, and they are generally shallow but rapid flowing, while the water is very cold; in some instances the observed temperature being 38°, while in one case it was 33°. Only one considerable branch was found flowing from the southward. This is called the Pah River by the natives, and it is used by them in journeying to the south; for a very short portage from its source enables them to reach one of the northern tributaries of the Yukon River, and they are thus brought in easy communication with the trading posts. It is believed that like easy portage can be made from the Putnam to the river discovered by Lieut. Ray near Point Barrow, and which empties into the Arctic Ocean.

The country about Putnam is mountainous. Long ranges extend along either side, but they are peculiar in existing in small detached groups, each of which possesses distinguishing characteristics, some being clearly defined, sharp, rocky peaks, while others are smoothly rounded. The higher ones are estimated at about three thousand feet. From the tops of those which were ascended the whole country to the north appeared to be a confused mass of mountain peaks, and the natives stated that the country was of the same character to the Arctic Ocean.

The country explored was found to possess a warm and agreeable summer climate, the thermometer having reached 115° in the sun, while the nights were cool. The valley of the Putnam is heavily timbered with spruce, birch, cottonwood, larch, and willow; while flowers were in abundance, roses being seen in large numbers. Cuttings of these latter, together with specimens of coal, gold, and copper, and a huge fossil trunk, form a part of the material collected for the Smithsonian Institution.

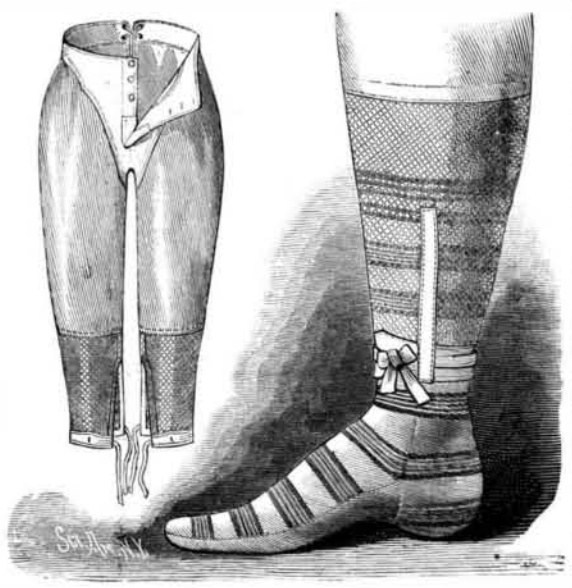
While Lieut. Stoney was absent, Ensign Purcell remained with two men in charge of the schooner, and made a survey of Hotham Inlet and the Selawik. He found that the Selawik River represented on the charts has no existence; but there is a channel, six miles in length, connecting Selawik Lake with a chain of three lakes to the eastward. He also found a five fathom channel over the Hotham Inlet bar.

The Ounalaska is a fifty-four ton schooner, and Lieut. Stoney was provided with two officers and a crew of eight men. There were no naturalists with the expedition.

While returning from his expedition, Lieut. Stoney encountered several severe gales. During one of the most severe he employed oil for stilling the waves, with marked success. The oil was rigged upon a spar to which a drag was attached, and the vessel was so maneuvered that the drag stood off the weather bow. The vessel holding the oil was so constructed that the oil was forced out in portions by each advancing wave. All the waves were affected by the oil, but the great foaming combers most markedly.

PATENT DRAWERS.

The top part of the drawers is made of woven or knit linen or cotton fabric, and the legs are made of the same material down to or a little behind the knees, and the lower part of the legs are of open work fabric. The perforated part of each leg is provided with an upright slit in the usual manner, and with bands or buttons at the lower end to hold the drawers leg securely, and at the same time prevent the socks from slipping off. The apertured parts permit of a free circulation of air, thereby keeping the legs cool and making the drawers comfortable and agreeable during hot weather. The front of the upper part of the drawers is



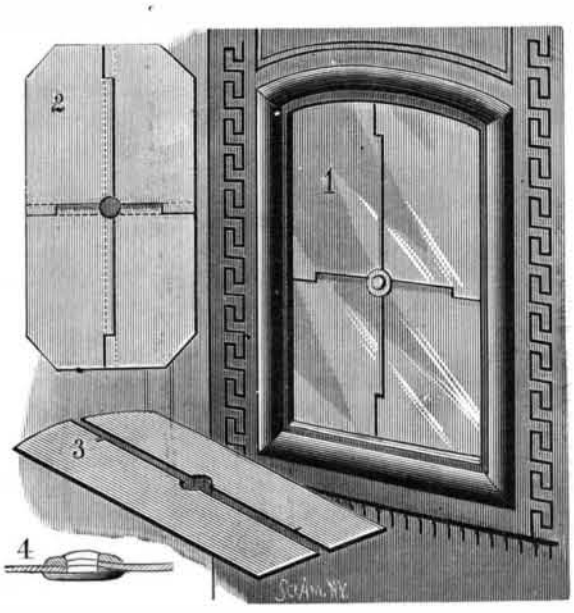
TOWLES' DRAWERS.

closed perfectly, one side overlapping and buttoning upon the other.

This invention has been patented by Mr. Wm. P. Towles, of 145 Baltimore Street, Baltimore, Md.

COMPOSITE MICA SHEET.

An invention recently patented by Mr. John L. Rorison, of Bakersville, N. C., is specially designed to meet the wants of retailers of stoves, who, with punch, rivet, and hammer, can join two or more small pieces of mica to form a sheet of any size and shape. Figs. 1 and 2 represent the completed sheet of mica, Fig. 3 shows the pieces separated, and Fig. 4 is a section through the rivet. In uniting four pieces the inner corner of each piece is slightly cut away, so that when they are put together a central opening will be formed for the passage of the rivet. The inner edges of each sheet are notched, so that when put together the edges lap past each other, forming good joints, and are at the same time locked in place. The contiguous edges being placed together, the rivet is inserted, when the washer is put upon the smaller end and the rivet headed down, thereby causing the head of the rivet and the edges of the washer to grasp and firmly hold the pieces. When only two pieces are used to form



RORISON'S COMPOSITE MICA SHEET.

the sheet, the edges are notched to form the lock joint, and the centers of the adjoining edges are cut away to make a passage for the rivet.

Civil Service Reform in Mines.

The recent mine explosion in the Connellsville region has led the mine inspectors to take steps to prevent a repetition of these horrors. This morning the inspectors met in this city. They will draw up a bill to present to the Legislature, in which miners ignorant of the business will be excluded from the mines. Pit bosses and men having charge of the ventilating of the mines will be required to pass a thorough examination before taking a position. It is also proposed that the inspectors move for establishing a school for the purpose of furnishing free instruction to men whose purpose is to engage in coal mining.

Magic Photographs.

What are called magic photographs are positives printed in a latent state upon white paper that it is only necessary to immerse in ordinary water to have the image appear.

The means employed for obtaining this curious and surprising effect are as follows: The positives are printed, from any negatives whatever, upon paper sensitized with chloride of silver, such as may be purchased of any dealer in photographic supplies. The printing is done with the aid of sunlight, either direct or diffused, in an ordinary printing frame, or, more simply, between two plates of glass held together by means of spring clips.

The image, when once printed, is fixed in a bath composed of 10 grammes of hyposulphite of soda dissolved in 100 grammes of ordinary water. It is not toned with gold, but is thoroughly washed with water after coming from the bath, so as to remove every trace of the hypo from the fibers of the paper.

This washing is absolutely necessary, in order that the paper may remain perfectly white after it has been treated with the following bath:

Bichloride of mercury	5 grammes.
Water	100 "

The image, when immersed in this bath, soon gradually begins to lose color, and finally disappears altogether. When the paper has become entirely white, it is washed in water and allowed to dry.

If it be desired to cause the latent image to reappear, it is only necessary to immerse the paper in a weak solution of hyposulphite of soda, or better of sulphite of soda.

To the back of these photographs there is attached a piece of bibulous paper impregnated with sulphite of soda. In this way, when the paper is immersed in water, the sulphite at once dissolves, and the image quickly appears.

The bichloride of mercury (corrosive sublimate) is a substance that should be used only with great precaution, as it is a violent poison. Care should therefore be taken to allow no delicate part of the body to come into contact with it, and to put the vessels containing it in a safe place out of reach.

The sensitive paper adapted for this curious recreation may be either albumenized or salted simply.

The sensitizing is performed by floating upon a 10 per cent nitrate of silver bath, for five minutes, either salted paper that may be purchased in this state or be easily prepared by immersing white paper in water containing 5 parts of table salt to 100.

After sensitizing, the paper is suspended by one corner, and allowed to dry in a dark place. For the balance of the operations one will proceed as above directed.

The *rationale* of the phenomenon is as follows: The image formed by the light is colored by the reduced silver. This image, when bleached by the bichloride, contains both calomel (chloride of mercury) and chloride of silver. Sulphite of soda possesses the property of dissolving chloride of silver, and of blackening chloride of mercury by forming a sulphide. —*Leon Vidal, in La Nature.*

How to Keep Cider Sweet.

Pure sweet cider that is arrested in the process of fermentation before it becomes acetic acid or even alcohol, and with carbonic acid gas worked out, is one of the most delightful beverages. The *Farm, Field, and Fireside* recommends the following scientific method of treating cider to preserve its sweetness. When the saccharine matters by fermentation are being converted to alcohol, if a bent tube be inserted air tight into the bung, with the other end into a pail of water, to allow the carbonic acid gas evolved to pass off without admitting any air into the barrel, a beverage will be obtained that is fit nectar for the gods.

A handy way is to fill your cask nearly up to the wooden faucet when the cask is rolled so the bung is down. Get a common rubber tube and slip it over the end of the plug in the faucet, with the other end in the pail. Then turn the plug so the cider can have communication with the pail. After the water ceases to bubble, bottle or store away.

Shameful Treatment of Inventors.

The fact that the revenues of the Patent Office are largely in excess of its expenditures is an unanswerable argument in favor of the very considerable increase of the clerical force in that office. American inventors do not ask to have reduced the fees which must be paid to get a patent. What they want is that their applications shall receive immediate attention, and that the money demanded of them shall be used to secure this for them. As the matter now stands, they are compelled to pay for that which they do not get. They are forced to submit to long and often ruinous delays because there are not enough clerks in the office to do the work, and meantime the money which they pay to have the work done is suffered to lie idle and accumulate until it now amounts to a fund of two or three million dollars. It would be difficult, we think, to conceive of anything more asinine than such an arrangement.—*The Textile Record.*

It is too bad, as our contemporary says, with such a large amount to the credit of the Patent fund, that the Patent Office should be crippled in its usefulness for the want of a sufficient clerical force to attend to the business, owing to a lack of a little Congressional wisdom. The inventors of the country are not small in numbers or weak in influence, and it is incumbent upon them to use their individual influence with the Congressmen from their respective districts in respect to the necessities of the Patent Office.