Correspondence.

One Source of Fires.

To the Editor of the Scientific American:

That a building could be burned by a telephone was demonstrated a few nights ago across the hall from my office. By some means the electric light wires in the street communicated with the telephone wires, which set fire to the telephone box. When discovered everything was in a bright blaze. Only a little while longer and an unknown conflagration would have occurred. The night was very damp, which aided the light current in passing to the telephone wires.

Atlanta, Ga. B. H. CATCHING.

Rain Conditions—A Note by Prof. Carl Myers.

To the Editor of the Scientific American:

I note that the article in the SCIENTIFIC AMERICAN, December 20, 1890, entitled "The Artificial Production of Rain," near the close quotes the opinion of H. C. Russell as follows: "Our only chance would be to take advantage of a time when the atmosphere is in a condition of unstable equilibrium, or when a cold current overlies a warm one. If under these conditions we could set the warm current moving upwardly and once flowing into the cold one, a considerable quantity of rain might fall, but this favorable condition seldom exists in nature."

The experience of the well known lady aeronaut Carlotta, as well as my own, is directly contrary to the idea of infrequency conveyed. The condition of a cold current overlying a warm one is common enough, and when ascensions were made immediately preceding rain, or several hours before it, a warm current was already established upward, and the air was warm and moist all the way up, and rain was invariably predicted by us after such observations, which were frequently made during the afternoons of July 4, which day seems to be especially favorable to balloon ascensions, atmospheric disturbances through concussions, and consequent rainfalls. CARL E. MYERS.

Frankfort, Herkimer County, N. Y., April 6, 1891.

A Nozzle Holder Wanted.

To the Editor of the Scientific American:

It has been proved by experience in this part of Florida that steam-pumped water can be used successfully and profitably for irrigating orange groves and truck farms. The soil is so loose that water will not run on the surface at all, and the only practical mode of applying the water, in most places where it has been tried, is to spray it by pressure and let it fall as in ordinary lawn irrigation. What is known as the "Holly system" is used; that is to say, an ordinary pumping station is erected at the water, pipes are laid over the ground to be irrigated, a regulator or governor is so adjusted that the back pressure will cut off the steam from the pump when the pressure in the pipes reaches the desired limit. By this means a practically uniform pressure can be maintained sufficient to spray the water. A main pipe leads from the pumping station through the field to be irrigated, and from this laterals run to the edge of the field, and on these lateral pipes hydrants are placed at convenient distances.

With a 6 inch main, 4 inch lateral, and 3 inch hose, and a pressure of 130 pounds, water can be thrown from an inch and a quarter nozzle 100 feet, and a circular area 200 feet in diameter can be irrigated without changing the location of the nozzle. But to do this the nozzle must be held at an angle of 45° to the horizon, and moved around at that angle. This distributes the water over a circular strip 16 feet wide. The nozzle must then be raised so that the outer limit of the water will fall 16 feet nearer the nozzle; a circuit of the nozzle at this angle irrigates another strip inside the first. This is continued, the nozzle being elevated and moved more rapidly at each circuit until the nozzle points to the zenith, when in a few moments the ground immediately around it receives the water. It requires, with pipes, hose, and nozzle such as I have described, about 40 minutes to distribute 9,000 gallons of water (one-third of an inch over the entire surface) on the circular area 200 feet in diameter. The distribution is very uniform, and the water is so sprayed as not to injure the tenderest vegetation. With the ordinary sprinklers now in use it is easy to irrigate the small spaces left between the circles. But the labor of holding the nozzle is expensive. The man gets wet in spite of gum suits, and he not only requires wages above ordinary labor, which is here worth $1 per day, but he is frequently made sick.

We need an apparatus that will do this work of holding the nozzle automatically, something that will move the nozzle around at an angle of 45° at a regulated speed; then elevate the nozzle to say 53°, move it around with increased speed at that angle, then elevate it to say 60°, etc.; or the movement might begin with the nozzle pointing to the zenith and then descending in constantly widening circles until it reached an angle of 45°, that being the point at which the greatest projection is obtained. It would be better to have each circuit made with the nozzle at the same elevation during the entire circuit; but it would answer all practical purposes to have the nozzle moved along a spiral inclined plane at a uniform speed, with the angle of inclination so adjusted that the time required for each circuit of the nozzle would be in proportion to the area to be watered during the circuit. For example, only a few seconds would be required when the nozzle points to the zenith to water the small area on which the water would fall. A little longer time would be required to water the area which would be reached when the nozzle made a circuit at an angle of 85°, still more when it made a circuit at an angle of 80°, and the area watered by the nozzle at an angle of 45° being the largest, the longest time would be required for that circuit.

If the apparatus was so adjusted as to cause the nozzle to descend from the zenith to an angle of 45° to the horizon, or to ascend from this angle to the zenith in 40 minutes with uniform speed, and during the ascent or descent to make eight complete circuits, the main purpose would be accomplished.

The motion to the nozzle could probably be imparted either by a spring or by a weight, or by water power obtained from a small orifice in the side of the nozzle or hose. In watering orange trees, it would be necessary to raise the apparatus 12 to 15 feet above the ground, and it should be so constructed that it could be fastened to the top of a post placed in the ground at the center of each circuit to be irrigated.

If somebody will invent and construct an apparatus, not too costly, that will do this work, a good demand will be found for it at once, with probably a largely increased demand in the near future.

DANIEL S. TROY.

Lane Park, Lake Co., Fla., April 10, 1891.

The Camera Obscura.

To the Editor of the Scientific American:

In your issue of April 11, Mr. Nicolas Pike has an interesting article on "Photography." In this he ascribes the invention of the camera obscura to Baptist Porta. I send you some brief notes on the "History of the Magic Lantern," to show you that an earlier date should be assigned to the discovery. You may reprint the notes if you please.

H. CARRINGTON BOLTON.

New York, April 15, 1891.

NOTES ON THE HISTORY OF THE MAGIC LANTERN.

The "magic" lantern is an outgrowth of the *camera obscura*, the origin of which is unknown. Its invention is usually attributed to John Baptist Porta, but Libri (*Histoire des sciences mathematiques en Italie*, Paris, 1841, 4 volumes, octavo) has shown that it was frequently mentioned by authors of much earlier date.

The first mention of the camera obscura occurs in unpublished MSS. of the celebrated Italian painter, sculptor and architect Leonardo da Vinci. Da Vinci was born in 1452 and died in 1519. His reputation as an artist is immortal, but it is less generally known that he was well versed in music, military science, mechanics, hydraulics, astronomy, geometry, physics, natural history and anatomy. In several of these branches he made original investigations, anticipating later philosophers.

In a MS. quoted by Libri, Da Vinci proposed a theory of vision which he seeks to explain by reference to the camera obscura. (*Libri* III., 54 and 233). This takes the invention back into the 15th century—say 1490.

In a work published in 1521 by Cæsariano, a Milanese architect, he attributes the invention to a Benedictine monk, Dom Panunce, which is, however, regarded as doubtful (*Libri* IV., 303).

Cardanus, an Italian physician, mathematician and author, also mentions the camera obscura in a treatise entitled *De verum subtilitate*, published at Nuremberg in 1550.

All these references antedate John Baptist Porta's work, "De Magia Naturalis," of which the first edition appeared in 1553, when its precocious author was only 15 years of age. While Porta was not the inventor of the camera obscura in its simplest form, he has the honor of first employing a convex lens to perfect the images, and of placing transparent drawings opposite the opening. To these drawings he attached movable parts, and thus produced astonishing effects, which the unlearned ascribed to magic, a term connected with the lantern ever since.

Porta's camera obscura consisted of a simple box with a small opening at one side, through which the rays of light entered and fell upon a white paper screen at the opposite side. The lens was subsequently inserted.

The difference between a dark chamber of this construction and a magic lantern is very slight, and consists chiefly in the relative position of parts and the source of illumination. By whom the great improvement was made, of substituting artificial light for sunlight in exhibiting transparent pictures, is unknown to the writer.

Deschales in his "Mundus Mathematicus" (Leyden, 1674) states that a Dane, possibly the physician Thomas Bartholin, showed him in 1665 a lanterna magica having two convex lenses (*Pogg. Gesch. Phys.*, p. 436).

Athanasius Kircher, a learned Jesuit, professor of mathematics at the Collegio Romano (b. 1602, died 1680), in his second edition of "Ars Magna Lucis et Umbræ," 1671, describes the magic lantern.

The oxy-hydrogen light now commonly used in connection with the exhibition of pictures by the lantern was the invention of Thomas Drummond, of the Royal Engineers (b. 1797, d. 1840), who employed it in 1824 in the trigonometrical survey of Ireland. The principle on which it is based had, however, been established in 1801, by Prof. Robert Hare, of Philadelphia. To prevent explosions from the ignition of the mixed gases, Dr. Hare also applied the principle of Sir H. Davy's safety lamp, but this was not altogether satisfactory, for it did not prevent some disastrous explosions. Later the so-called "safety jet" was introduced, consisting of concentric tubes which prevent the gases, oxygen and hydrogen, from mingling previous to their issuing from the orifice. This invention is variously ascribed to Hemming, Maugham, and Daniell. The publication of the latter is dated 1833.

H. C. BOLTON, New York City.

Prevention of Damages to Sea Shores.

To the Editor of the Scientific American:

For many years severe easterly winds and storms have caused much damage at many places along the sea shore by driving the waves in upon the beach with sufficient force to wash away the sand and bluffs to an alarming extent, necessitating the moving of buildings and walks, changing of roadways, and in general ruination of valuable properties. Cape May Point has suffered probably as much as any other place along the Jersey shore. Here it is not only the easterly winds and tides driving the waves in upon the shore, but also the flood and ebb tides that run in and out of Delaware Bay, sweeping away the sand washed up by the waves.

Engineers have been consulted and many thousands of dollars spent in driving pilings to form jetties and in building strong sea walls; but all of these structures have proved but futile efforts to stop the inroads of the sea.

The storms of last fall damaged a thousand or twelve hundred feet of the front to such an extent as to require the moving of one large building back quite a distance. And as eight dwellings and two churches more would be jeopardized by another storm, the property owners became alarmed, and they called a meeting of those interested to devise some plan to save the front. At that meeting theories were advanced as to the cause of the damage and remedies needed.

It was finally decided that the cause came from the driven waves washing and loosening up the sand, some of which was carried back with every receding wave till it came in contact with the current, and was carried away to be deposited where there was no current, or where there was an obstruction formed to collect it. And the remedy would be a solid, tight jetty, to stop the current. This would form an eddy on either side of the jetty, and the sand would be collected.

A committee was appointed to enter into a contract to have one built and to be paid for by private subscription.

This jetty was completed last November, and since that time the shore has not only been saved from further damage, but on each side of the jetty the shore has made out more than 100 feet and gradually is filling out further.

The top of the sand first collects about on a level with the average tides; each storm tide that washes over the level surface of made ground carries sand further back and raises the inner shore to the top and above the reach of the highest tides.

The result in this case clearly demonstrates the feasibility of jetties to not only prevent the washing away of the shores, but to add thereto. The peculiar shape of this jetty aids in collecting sand, as it does not cause sudden resistance to waves.

Where jetties are built exposed to all storms and the pounding of the waves, it is necessary to have the strongest kind of structures to prevent them from being carried away by the force of the sea.

This plan of jetty is A-shape, which avoids sudden resistance to waves and heavy seas. There are two rows of planking sunk into the sand by hydraulic pressure, the sides being on an angle of about 45 degrees, the planks meeting at the top or ridge, and a ballast floor; all secured to a heavy framework of timbers well tied together by iron bolts, and the structure loaded with stone ballast, 1,500 or 2,000 pounds to the lineal foot.

Germantown, Pa. S. E. HUGHES.

A Five Thousand Mile Railway.

The great Russian railway from Vladivostock on the Pacific Ocean through Siberia to St. Petersburg has been ordered and operations begun. This road will be 4,810 miles long—with spurs, more than 5,000 miles in all. The cost is estimated at one hundred and sixty millions of dollars. It will open many regions rich in minerals and agricultural productions.