

## Correspondence.

## The Fluoroscope.

To the Editor of the SCIENTIFIC AMERICAN :

While experimenting with a half dozen lot of Geissler tubes recently, I found two of them to give the Roentgen effect sufficiently to light up my fluoroscope very well.

The length of the tube permits one to reach a definite conclusion regarding the terminal, which is important in X ray work. While the question has been definitely settled, yet it may interest some of your readers to apply this simple test. Turn the screen toward the anode so no light can reach it from the cathode, and nothing is observed, then turn screen toward the cathode, and at once light is seen to come from that source.

J. T. COLEMAN.

Charleston, S. C., July 16, 1896.

## Barisal Guns.

To the Editor of the SCIENTIFIC AMERICAN :

In your issue of June 27 you speak of the Barisal guns, and ask if any one knows of a like occurrence. On the evening of December 28, 1885, I was with a companion in a sail boat on the Gulf of Mexico, about twenty miles southeast of Cedar Keys, Florida. We were becalmed. The next morning the sky was cloudless. There was a light fog and no breeze, the atmosphere was bracing, but not frosty. We were about ten miles out, but in shallow water. Shortly after sunrise were heard reports as of a gun or distant cannon. They came at intervals of about five minutes. We were not certain as to the direction. My companion, who lived several miles further down the coast, said he had often heard those reports on still mornings.

New Castle, Ky.

W. S. COOPER.

## Effect of a Volcanic Eruption.

The bombardment in some places must have been terrible. I have seen tracts of land, once smooth and fertile plantations, now covered with the great rugged stones so that you have to pick your way among them as you pass. Many of them are four or five feet broad. Of course, these are only the larger stones; the little ones were buried under the soil long ago.

Stones seem to have fallen all through the eruption, sometimes in one place, sometimes in another. Not long after the first expulsion of smoke, a negro boy was tending goats on a hillside. I have seen the place often. Suddenly a small stone fell near him, and then another. He thought that some of his playmates were pelting him from the bushes, and so began to throw stones in return. But the contest was too unequal, for it was the mountain that was throwing stones at him; and ere long he fled in terror, leaving his goats to their fate.

I have no space to tell you the whole story of this great eruption; how many plantations were ruined by the shower of stones, and, far worse, how fifty or perhaps a hundred people were killed by them, with great numbers of cattle and horses; how the lava dammed back a stream and formed a boiling lake, which broke through after a month and came hissing down the valley, overwhelming a whole negro settlement; how ashes were carried five or six hundred miles out to sea and Barbados, eighty miles off, was darkened by the cloud, so that people had to grope their way at noon and use candles in their houses; how the explosions were heard hundreds of miles away, and it was thought that they were the guns of a great fleet or army.

But one thing I must tell you. When the eruption was over and people could ascend the mountain again, they found the crater—the one Dr. Bell had visited—all changed. Instead of the smoking cone, there was a lake of water nine hundred feet below, filling the whole area, and so deep that no one has ever been able to fathom it. And besides this, separated from it only by a thin wall, they found a new crater, even larger; it was nearly a mile long, three-quarters of a mile wide, and eight hundred feet deep, with sides like walls. That pit was blown out by the great explosion.

I have stood between the two craters, and looked down into them. The new one is green and pretty now, with bushes and ferns, and no signs of fire; but the old one is a hideous depth of gray green water, through which bubbles are always ascending and bursting into sulphur fumes at the top. Sometimes the wind carries these fumes over the neighboring plantations, for miles around, as if to warn people that the old fires are not yet extinct. I hope it may be long before they break out again!—Herbert H. Smith, in St. Nicholas.

A CURIOUS phenomenon, first discovered by M. Charles Margot, was shown in a modified form recently by Prof. Roberts-Austen. An electric current was sent through an aluminum wire, raising it to a temperature of 400° above its melting point. Strange to say, it did not fall, the film of the oxide on its surface holding it intact. In this condition it was attracted, owing to the current within it, by a magnet, and by careful manipulation could be made to tie itself into a knot.

## Interesting Statistics of Altitude.

In the Niagara rapids the water descends 52 feet in less than a mile; the falls are 164 feet high on the American side and 150 on the Canadian. Mount Lebanon, from whose sides were cut the cedars for Solomon's Temple, is believed to be the highest elevation in Syria, 11,000 feet. Lake Titicaca, in Bolivia and Peru, is 12,000 feet above sea level. It is the highest lake in the world, being 100 miles long by 35 in width. Mount Etna, the largest volcano in Europe, and one of the largest in the world, is 10,050 feet high and 90 miles in circumference at its base. In 1843 Mauna Loa poured out 17,000,000,000 cubic feet of lava; in 1855, 38,000,000,000 feet. In 1859 the lava stream from this volcano ran 50 miles in eight days. The Peak of Teneriffe, 12,236 feet high, is the greatest altitude in the Canary Islands. It is said to be visible at sea, in clear weather, for nearly a hundred miles.

The River Jordan makes the greatest descent in the shortest distance of any stream. During its course of 120 miles it has twenty-seven falls and descends 3,000 feet. It is said by some geographers that Mount Wrangel, 140 miles west of Mount St. Elias, is over 20,000 feet in height, but no authentic measurements have been taken. Mont Blanc is 15,776 feet high. This famous mountain is exceeded in height by many, but its position in the line of tourists' travel has given it a name above many others. Chimborazo, in Ecuador, 21,444 feet, is said to be the highest in that State. Cotopaxi, 19,408 feet, and Antisana, 19,150 feet, are second and third in the order of their height. Mount Ararat, 12,700 feet, is the highest land in Armenia. The perpetual snows that lie upon its summits are believed by the dwellers in the valleys beneath to cover the remains of Noah's Ark. Kilauea, a part of a cluster of volcanic mountains denominated Mauna Loa, is only 3,970 feet high, but is the largest active volcano in the world. Its crater is a great pit 8 miles in circumference and 1,000 feet deep.

Pike's Peak, where gold was first discovered on this side of the Rocky Mountains, is 14,320 feet high. The "Roof of the World," the plateau in the Pamirs of Thibet, is from 10,000 to 15,000 feet above sea level. Mauna Loa, in the Hawaiian Islands, is 13,760 feet high; Mauna Kea, 13,963 feet; Mauna Hualalai, 7,822 feet. Mount Sinai, the mountain from which the law of Moses is said to have been delivered, is 8,000 feet high. California has forty mountains, each of which exceeds 10,000 feet, and quite a number are more than 12,000. The Simplon, under the shadow of which lay the once famous stage route from France to Italy, is 11,542 feet high. There are 412 mountain peaks in the United States, or its Territories, each having a height greater than 10,000 feet. Mount Miltin, 12,000 feet, is the greatest elevation in Morocco. Although almost under the equator, its summit is never free from snow.

The Illimian Mountain, a peak 21,780 feet, is the highest point of land in Bolivia. There are extensive districts in Sahara which are below the level of the ocean. White Top, 5,530 feet, is said to be the greatest recorded altitude in Virginia. High peaks are numerous in Colorado; there are in that State of mountains 178 peaks, each of which towers above the sea to a height greater than 10,000 feet. The steeple of the famous Cathedral of Strasburg rises to a height of 474 feet.

There are ten mountain peaks in Arizona, each of which exceeds 10,000 feet in height. Clingman's Mountain, 6,707 feet high, takes precedence of all others in North Carolina. There is no mountain 10,000 feet high on the American continent east of the Rockies. There are two or three lakes in Colorado more than 10,000 feet above the level of the sea. Popocatepetl, 17,775 feet above the sea, is regarded as the highest elevation in Mexico. In New Mexico there are thirty mountain peaks rising above an altitude of 10,000 feet. The peak of St. Gothard, above the pass of the same name, in the Alps, is 9,080 feet high. Mount Olympus, whose summit Homer made the abode of the gods, is 9,754 feet high. The cross on the dome of St. Peter's, in Rome, is 448 feet above the pavement of the portico. The chimney of a noted chemical factory in Glasgow, Scotland, is 454 feet in height. Most of the lower valley of the Po, in Italy, is from 5 to 40 feet below the level of the stream. The pyramid of Cheops is 543 feet, but about 30 feet of the former top was ages ago removed. Mount Marcy, in New York, 5,403 feet above sea level, is said to be the highest in that State. Mount Parnassus, the home of the Muses, is only 3,950 feet high. The tower of the Parliament house, in London, is 340 feet high. Stromboli, the island volcano, off the Italian coast, is 3,850 feet high. The most extreme altitude in Alaska is Mount St. Elias, 19,500 feet. Bentonville is the highest point in Arkansas, 1,790 feet above the sea. Long's Peak, the celebrated landmark in California, is 13,400 feet high. Wyoming has forty-four mountain peaks, each of more than 10,000 feet. Mount Shasta, the celebrated volcano of California, is 14,450 feet high.

The cross on the Duomo, in Florence, is 380 feet above the foundation. Mount Pindus, the seat of Greek history and romance, is 7,677 feet high. The dome of the Capitol, in Washington, is 300 feet above the pavement. Mount Rosa, in the Sardinian Alps, is the highest in that region, 15,550 feet. High Knob, 1,799 feet above

sea level, is the highest point in New Jersey. Mount Washington, 6,288 feet high, is the highest peak in New Hampshire. Lake Victoria Nyanza, in Africa, is over 4,000 feet above the level of the sea. Mount Carmel, where Elijah slew the prophets of Baal, is 2,000 feet high. The summit of Notre Dame Cathedral, at Amiens, in France, is 422 feet high. The highest falls are those of the Yosemite, some of which exceed 3,000 feet.

The Eiffel Tower is 990 feet high. The Rock of Gibraltar is 1,470 feet. The famous tower of Utrecht is 464 feet. Mount Pilatus, in the Alps, is 9,050 feet high. Bunker Hill Monument is 220 feet in height. The Brooklyn Bridge is 278 feet above the river. The porcelain tower at Nankin was 248 feet high. The Sea of Galilee is 653 feet below the Mediterranean. The Washington Monument is 555 feet from base to tip. The Statue of Liberty, in New York harbor, is 305 feet high.—St. Louis Globe-Democrat.

## Protecting Electric Apparatus Against Lightning.

The problem of protecting electric apparatus against lightning has not been altogether one of invention; it has been quite as much one of careful and patient observation. Four years ago it was customary to place a single lightning arrester at the point where protection was desired. To-day the same point is protected by distributing line arresters at frequent intervals over the system. This change has resulted partly through the invention of more simple and effective lightning arresters—instruments which can be trusted at a distance from station attendants and which are free from the necessity of occasional inspection; but perhaps more through a more complete understanding of the problem—of the conditions which have to be met.

The most important characteristic of static discharges from electric circuits is that of selection. Discharges do not, as has been commonly supposed, follow the "shortest and easiest path to earth." Where this case, one arrester carefully installed would be all-sufficient. The discharge being selective, it is very certain that one arrester is not sufficient, and further, if line arresters be connected at frequent intervals, the path which will be selected will more and more likely be one of the arresters rather than the apparatus in proportion as the number of arresters is increased. This statement is sustained in practice by the rapidly growing use of line arresters. Station arresters are perhaps advisable as an extra precaution, but in general dischargers entering the station offer a fair indication that more lightning arresters are needed on the line.

The question naturally arises: "How many lightning arresters should be connected to a given length of circuit?" The writer recommends four to the mile of wire, but this is by no means to be taken as an invariable rule; much depends upon the local conditions, the character of the soil with reference to ground connections and liability of lightning to strike, the grade of insulation to be protected, the voltage of the circuit, which latter governs the safe spark gap length which may be employed, and the surroundings with reference to telegraph and telephone wires. In general, thickly settled districts tend to decrease the number of lightning arresters which may be required.—A. J. Wurts, in Casier's.

## Household Inspection of Plumbing.

The following questions are given by Mr. Reuben S. Bemis, inspector of plumbing of Providence, R. I., in his report for 1895 as likely to call the attention of householders to points in their plumbing which should be carefully regulated:

Have you a plan of the system of pipes in your house?

Is all the plumbing work exposed to view or easily accessible?

Are the fixtures on the different floors placed over each other so as to avoid horizontal soil and waste pipes?

Are all the pipes airtight as shown by a proper test? Is the continuation of the house drain outside of the house to the sewer or cesspool properly laid?

Does each water closet have a sufficient supply of water discharged with sufficient force when emptied completely to scour the traps and branch waste pipes?

Are all objects excluded from the water closet which are likely to obstruct the pipes?

When a fixture is not in use for some time, are arrangements made to prevent the water seals in the traps from being broken by substituting oil for water?

Are the traps so arranged as to resist siphonage?

Mr. Bemis also calls the attention of householders to the fact that the water in the traps of the plumbing is apt to evaporate when people go away and shut up their houses for the summer, and that this leaves an open entrance from the sewer to the house. The Engineering Record suggests that the drying of the pipes makes it possible for disease germs on their sides to float upward as dust and get into the house and into the systems of the occupants when they return in the fall, and Mr. Bemis suggests that the outbreak of typhoid fever so often following the return of people to their homes in the fall may be caused by this neglect of the plumbing.