IN THE FIELD OF ELECTRICITY

RECENT tests of electric power as a substitute for mule power on the Erie canal centers attention on the practicability of the new motor for the purpose intended, and provoked an acrimonious discussion of the motive of the test. The test was made a few days before the election at which the voters of New York state approved the proposition authorizing the widening and deepening of the canal so as to accommodate barges, the cost being estimated at $101,000,000, and that the purpose was to discredit the proposition by showing that with electric power the present canal would subserve public interests as well as a barge canal and save the state a tremendous debt. Whatever the motive was, it is evident from the details of the test that the so-called "electric mule" justified the claims of its owners. Four boats, loaded with 250 tons of sand, were used. First two boats were started from each end of the track to demonstrate the ease with which the boats and mules pass. Then tests were made with one mule. One, two, three and four boats were drawn against the current. The mule took the four boats at a speed of five miles an hour. The average speed with horses or mules is a mile and a half an hour and about two miles an hour with steam.

For the demonstration an elevated traction way was constructed a mile and a half long, on the outside of the towpath, one rail being placed above another so that the motor cars might pass and repass without interference. The structure is so arranged as not to interfere with barges being towed by animal power.

In operation the so-called "electric mule" rests on two wheels, which groove about the top rail. Beneath the locomotive are under wheels, also grooved. The under wheels by means of powerful springs clamp tightly against the under rail, allowing the machines to run along on the single rail.

Under the present method of towing by mules a cargo of 160 tons to each boat is considered very heavy going westward against the current. In the trial in question the electric locomotive readily hauled four canal boats, each loaded with cargoes of 250 tons, against the current at a speed of five miles an hour.

Achievements In Electrical Chemistry.

At a meeting of the American Philosophical society in Philadelphia recently Prof. C. F. Chandler of Columbia university reviewed the most remarkable achievements in electrical chemistry during the past twenty-five years, all of which were due to the inventive skill of young Americans. Prof. Chandler said that Niagara Falls was the center of electro-chemical industry in this country, and that various processes were carried on there with most profitable results, which until a few years ago were regarded as impossible. For thousands of years, and until the last century, the only agent which the human race was able to use for bringing about chemical change in metals was fire. In 1836 Jacobi invented the art of electro-metallurgy, and in 1839 Daguerre introduced chemical change brought about by means of light.

Electricity was not a very practical agent in chemistry until the rynamo was invented. This made possible the use of electric force developed by water power, and afforded the means of immense advances. Young American chemists took up electrical chemistry, and in some respects have led the world in this branch of science. Some of the most brilliant discoveries are due to Hamilton Y. Cassiner, who first cheapened the production of aluminum.

He was followed by Charles M. Hall, a student of Oberlin college, little more than a boy, who invented a process which reduced the cost of the metal from $5 to 50 cents a pound. Cassiner had meanwhile created a great factory, and had millions of capital behind him. He proceeded to improve his processes, by which metallic sodium and caustic soda had first been made with sufficient cheapness to enable him to make aluminum for the commercial market. He developed the manufacture of peroxide of soda, for use as a bleaching agent, and cyanide of potassium, used in extracting gold from poor ores.

Then he utilized a discovery made by Sir Humphrey Davy in 1807, whereby metallic decomposition was effected by electricity. He invented an apparatus in which the electrical heat could be kept at a certain point, and thus solved a problem that had puzzled chemists for 180 years, the production of caustic soda and chlorine free from salt. Cassiner found it necessary to produce something to resist the corrosive reaction of the liquids in his apparatus. In this way artificial graphite came into use.

Dr. Chandler told of the early experiments by the old German professor, Heinrich Rosa, in the production of aluminum with alumina and cryolite more than fifty years ago, and how Hall, employing electricity, devised a cheap and rapid process of reaching the same result. He humorously touched upon the granting of a patent upon this process to another man, through a decision of the United States Court of Appeals, long after Hall had obtained his patent, when, as a matter of fact, the first credit of the idea belonged to Sir Humphrey Davy, the great English chemist.

An interesting description of the process of manufacturing carborundum, the hardest substance in existence next to the diamond, was given. The specimens of carborundum shown glittered almost like compacted masses of black gems. In the process from 8,000 to 20,000 degrees of heat is used. The same process produces artificial graphite, the crude material being anthracite coal. The discovery and process of making acetylene were described. The lecturer also told how the secret of preparing artificial fertilizers, suitable for certain plants, was learned from a study of the bacteria inhabiting the nodules on the roots of vegetables

Large Water Power Plant.

One of the largest waterpower plants in the country is now nearing completion at Spier Falls, on the Hudson river, about eight miles southwest of Glens Falls, N. Y. The river here, caught between two spurs of the Adirondacks, is, by means of an immense masonry dam, raised fifty feet above its old level and a fall of eighty feet made available for the turbine wheels. The watershed of the Hudson above this point amounts to 27,000 square miles and gives a mean annual flow over the dam of between 6,000 and 7,000 cubic feet per second.

The dam, which was begun in June, 1900, is 1,320 feet long, and in some places nearly 100 feet in height. It is carried down to bedrock, built of solid masonry and anchored at each end in the ledges of the mountain sides. The power is obtained by ten pairs of turbine water wheels running on horizontal shafts; eight pairs each having a capacity of 5,000 horsepower and two of 3,400 horsepower each, so that the wheels have a combined capacity of 46,800 horsepower. Each pair of wheels is directly connected to a 2,500 kilowatt electric generator, except the two smaller one's which run 2,000 kilowatt machines. The electrical output is thus 32,000 horsepower. The water is carried to the wheels through ten steel tubes twelve feet in diameter.

The current is generated at about 2,000 volts and raised to 30,000 volts for transmission. This is done by thirty transformers, designed to operate at either 15,000 or 30,000 volts. The brick power house, which is of the most substantial construction, its foundation being concrete masonry bedded in the rock, is 282 feet in length and seventy feet wide. Although only the foundation and floor are now completed, the demand for power has been so sharp that the 2,000 kilowatt generators and one of the 2,500 kilowatt machines have been set under temporary sheds and are regularly supplying current. The generators, owing to the large excess of capacity of the turbines, are carrying the loads satisfactorily, although only sixty feet of head is yet available.

The triangular section between Glens Falls, Schenectady and Albany, containing a population of about 300,000 and many large manufacturing enterprises, is the market which the Hudson River Waterpower company will supply. They already own several local electric companies and one of the first uses of the water power current will be to replace the expensive steam driven local stations. Another water power station just below Mechanicville, on the Hudson, owned by the company, has a capacity of 7,000 electrical horsepower. Their total available electrical power is thus 39,000 horsepower. Thirty-five thousand of this has already been contracted for, one concern alone, the General Electric company, taking 10,000 horsepower, so that the financial success of the installation is already assured.

Power is also being supplied at several sub-stations of the Hudson Valley Electric railway, which runs from Troy to Glens Falls.

The Hewitt Lamp.

That electric lamp which Peter Cooper Hewitt invented is appearing in New York factories and composing rooms these days, in Boston it is rapidly coming into popular use. It was the general opinion that the lamp, when it was first called to the attention of scientists by the son of the late Abram S. Hewitt, was merely a scientific toy, with which the wealthy young man had passed a few of his leisure hours. Now it is being used by hundreds of persons who have never stopped to inquire who invented it.

Nobody would use the lamps in a place where dress samples are matched, for it has no red rays, and it may give a totally different idea of colors from those which really exist. It's hardly the kind of illumination for ballrooms or for lighting the interior of private houses, but for other purposes Boston has found it just what it has long sought. The light has a violet tinge, which shades into a pale greenish hue. Its general effect is rather ghastly at first, but for places where men have to have bright illumination while they work over machines, drills and type cases it has proved its value. In Boston it is being used in warehouses, machine shops, factories, printing offices and places where great accuracy of sight is required. The lamp is much used by photographers, who say that they can take pictures by it much more rapidly than they can by daylight.

One of the advantages of the light is that it makes use of a current of high voltage, yet gives a steady illumination, where with another system the effect would be almost blinding. On account of its absence of red rays it is easy on the eyes and is well adapted to the use of those who work at night, provided their tasks have nothing to do with fine discriminations between colors.

Mr. Hewitt, the inventor, returned a few days ago from Europe and has resumed work in his laboratory in Madison Square garden tower. He is experimenting with wireless telegraphy, for he hopes to make some of the principles of his electric light useful in the transmission of electric waves through the air.

In principle the Hewitt light is very simple. The electric currents flow into a sealed tube, in which there is a mercurial vapor. At either end of the tube are electrodes, positive and negative. When a high current is turned on the resistance is broken down by the presence of the vapor and the tube is filled with light.

Current Notes.

Another recent trial on the Marienfelde-Zossen railway in Germany resulted in a speed of 131½ miles an hour being obtained.

An electric railway will shortly be opened in Italy, which will serve as a feeder to the existing cable railway on Mount Vesuvius, says the Electrician, London. It connects the lower terminus of this mountain railway with the small town of Resina. The total length of the line is 7.5 km., the difference in altitude between the termini being 700 meters.

A resident of St. Paul, Minn., by the name of Breneman is said to have invented a machine which he calls the electroscope, and by means of which a person may see another at a distance. The apparatus contains two lenses, behind which are selenium cells. We have heard of similar inventions before, and trust this one will prove more successful than some of the others.

A communication from Mr. Richard Guenther, consul-general to Frankfort, Germany, states that successful experiments have been made in various forests of France in cutting trees by means of electricity. A platinum wire is heated to a white heat by an electric current and used like a saw. In this manner the trees are felled much easier and quicker than in the old way; no sawdust is produced, and the slight carbonization caused by the hot wire acts as a preservation of the wood. The new method is said to require only one-eighth of the time consumed by the old sawing process.

A correspondent of the Scientific American tells of a free electric current he has been using, as follows: "I was working on bell work in Tremont, N. Y., in a new building, and was to find out where the trouble was which had given the men so much annoyance. Testing out, I got in circuit a Croton water lead pipe and also a New York telephone lead cable, and to my surprise I received a current of six volts and about ten amperes. The current I found strong enough at times to run an Edison dental battery motor. Now I believe this lost current is coming from a trolley line in its return circuit, or it may be the discovery of tapping the earth for current. I notice the current becomes stronger when a trolley car is coming near, also that it is a steady current night and day, as I have the motor running all the time now."

New and Old Wonders

The seven world wonders of antiquity were:

The Pyramids, Babylon's Gardens, Mausolus' Tomb, the Temple of Diana, the Colossus of Rhodes, Jupiter's Statue by Phidias, and the Pharos of Egypt, or, as some substitute, the Palace of Cyrus.

The seven wonders of the middle ages were:

The Coliseum of Rome, the Catacombs of Alexandria, the Great Wall of China, Stonehenge, the Leaning Tower of Pisa, the Porcelain Tower of Nankin and the Mosque of St. Sophia at Constantinople.

How will these compare with the seven wonders of the modern world? Perhaps there may be a difference of opinion as regards the latter-day wonders, but permit me to name these:

The Steam Railroad, the Telegraph, the Telephone, the Wireless Telegraph, the Ocean Steamship, the Submarine Man-of-War and the Airship.

We of the new world have a few wonders, seven of which are:

The Brooklyn bridge, the Underground railroad, including tunnels to Jersey City and Brooklyn; the Washington monument, the capitol at Washington, with its dome, weighing 8,000,000 pounds; the modern steel skyscraper, the Echo mountain searchlight of 375,000,000 candle-power, and the United States Steel corporation.

We are speaking of things made by man; of those wonders given to us by God the seven are:

Niagara Falls, the Mammoth cave, Old Faithful, the tireless geyser in Yellowstone park, the big trees (Sequoia) of California, the Grand canyon of the Colorado, the great fresh water lakes and the Great Salt lake.—New York Press.