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THE DESERET MUSEUM.

The Salt Lake Literary and Scientific Association is a body corporate, under the laws of the Territory of Utah, with headquarters at Salt Lake City. The association is the proprietor and promoter of the Deseret Museum, a depository of choice and extensive collections in the field of natural history and ethnology. Under the auspices of the Deseret Museum, the wonderful selenite formation in Wayne County, Utah, has been worked, and of the magnificent crystals thus obtained upward of fifteen tons have been gratuitously distributed to museums and other institutions of learning throughout the United States and in Europe. The specified purposes of the association are the promoting of study in literary and scientific subjects, especially the encouragement of the pursuit of natural history, including ethnology and the formation and preservation of museums and libraries.

For the better carrying out of the association's objects, a building has been recently erected and equipped in Salt Lake City, of which the accompanying pictures are illustrative. The structure is of pressed brick, with gray sandstone trimmings; is 90 feet in length and 67 feet wide, comprising three floors and a basement. A central tower rises on the west or front side. This is utilized on the top floor for meteorological work. Regular courses of evening lectures have been conducted during the past year and class work has been carried on during the day. A limited number of students has been admitted to the day classes, with the privileges of the laboratories; but the evening lectures are open to the public, with proper restrictions.

In the basement is situated an efficient heating

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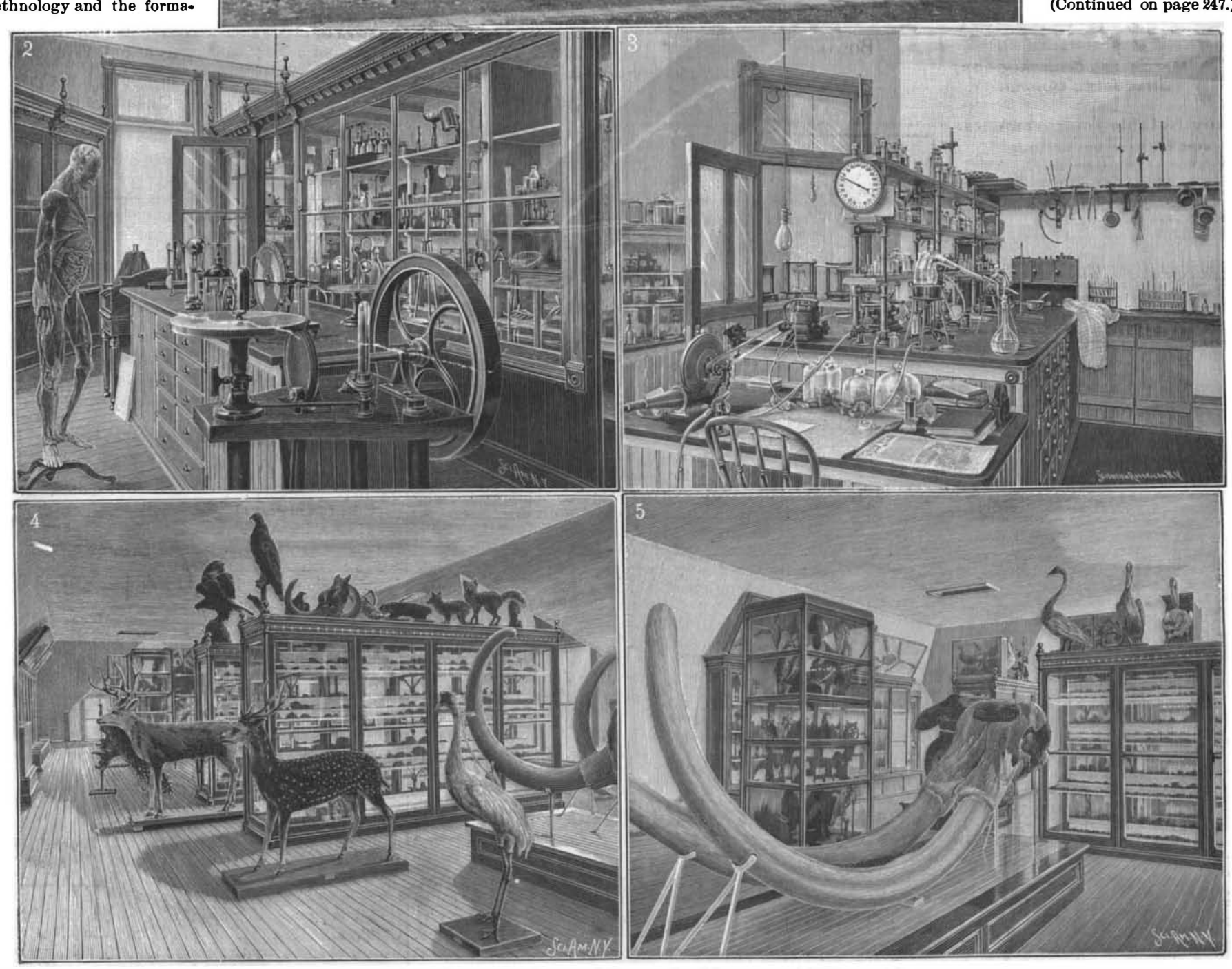

1. Front view of the building. 2. Apparatus room. 3. Curator's private laboratory. 4 and 5. Main rooms of museum.

THE DESERET MUSEUM, SALT LAKE CITY, UTAH.

THE DESERET MUSEUM.

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and ventilating plant, toilet rooms, storage rooms for chemicals, chemical apparatus, and mineralogical material, and a commodious assay room. The main lecture hall, 16 by 32 feet, has its principal entrance on the first floor, the seats being terraced, to give from all parts a view of the demonstration table. This table is provided with commodious pneumatic trough, gas, electric wires from primary and storage battery, and numerous other facilities, and for lectures without demonstrations a movable platform is placed behind and on a level with the table. The wall in front of the audience is used in place of a screen for stereopticon projections. On the first floor are also three smaller lecture rooms and an office.

The second floor is entirely devoted to physical science. A small lecture room is provided with a demonstration table, similar to that in the main room, and an extensive series of charts occupies a frame behind the table. A laboratory for general chemistry, 33 by 32 feet, and another for analytical work, 32 by 25 feet, are on this floor.

The laboratory rooms are excellently lighted, and the tables are set diagonally, so that no worker intercepts his neighbor's light. A combustion table covered with asbestos mill board and provided with blowpipe and blast, an anvil, and other appliances, are conveniently located in each room.

The apparatus room (Fig. 2) contains a main case, 25 feet by 9 feet high by 5 feet deep; two corner cases, each 9 feet long and of height and depth corresponding to the other. The apparatus constitutes a particularly full equipment for demonstrations in natural philosophy and in general and analytical chemistry. The physical lecture and chemical apparatus for demonstration alone has cost about $15,000. The curator's private laboratory (Fig. 3) is very completely fitted up for analytical and general work. It contains a well equipped working table, a table for blowpipe analysis, and a corner table for occasional work with the microscope, hoods with automatic burners, cupboards, etc. A balance room adjoining the private laboratory gives protection to two pulp and pharmaceutical balances, a Becker long arm analytical, a Sartorius short arm analytical, a Troemner assay balance, and a Mohr specific gravity balance. These are mounted on marble slabs, carried by iron supports independent of the floor. The curator's private office, an assistant's laboratory, and a dark room complete the apartments of this floor.

The third floor is occupied wholly by the museum. The stair landing carries two upright cases, in which is an excellent display of the finest of the selenite crystals taken from the Wayne County geode. The main room extends the entire length of the building and is 32 feet wide. It holds thirteen upright floor cases, and wall cases along one entire side. This room is devoted mainly to mineralogy and geology, though some cases are occupied by shells and corals. Two other rooms are given up to zoology and ethnology respectively. At the time Figs. 4 and 5 were taken some of the prominent zoological specimens were still in the main room. At present the catalogue shows upward of 3,000 mineralogical and lithological specimens; a thousand paleontological specimens; 500 vertebrate preparations, whole or parts; 2,000 invertebrate preparations; and nearly 1,000 ethnological specimens. The Deseret Museum enjoys the distinction of having been admitted to membership in the Museums Association. It sent an officer to the London meeting of this association in 1893 and expects to be similarly represented at the approaching Dublin meeting set for June, 1895.

For the interesting particulars here presented we are indebted to Dr. James E. Talmage, who has been called to the newly endowed chair of "Deseret Professorship of Geology" in the University of Utah, of which the Museum now forms a part.

The Early History of Telephony.

We reproduce below the text of the reply of Professor D. E. Hughes, F.R.S., to the toast of "Our Guests," at the banquet given by the staff of the National Telephone Company, London, March 15th last.

I am exceedingly grateful to you for having so kindly mentioned my name in connection with the toast of your guests, and I am sure that I am only expressing the sentiments of all your guests in thanking you for having so kindly invited us to participate in this magnificent banquet on such an important occasion.

To me this is indeed an important event in the history of telephony, for I see around me some 200 members of the staff of the National Telephone Company, which now represents one of the most useful and powerful commercial organizations of the present age. When I look back only some 40 years to the first printed idea in France, and some 30 years to the birth in Germany of its first telephone, and that it is only 18 years since the idea became really practicable, I am indeed astonished at its widespread success, so that what was a few years since a scientific toy now has become a necessity of our present age.

The earliest record of a perfect theoretical electric telephone was contained in Du Moncel's "Exposée des Applications," Paris, 1854; when M. Charles Bourseul, a French telegraphist, conceived a plan of conveying sounds and speech by electricity. Suppose, he explained, "that a man speaks near a movable disk sufficiently flexible to lose none of the vibrations of the voice, that this disk alternately makes and breaks the current from a battery; you may have at a distance another disk which will simultaneously execute the same vibrations." Unfortunately M. Bourseul did not work out his idea to a practical end, but in these few words we have the shortest possible explanation of the theory of our present telephones.

It is now exactly 30 years since my first experiments with a working telephone, for in 1865, being at St. Petersburg in order to fulfill my contract with the Russian government for the establishment of my printing telegraph instrument upon all their important lines, I was invited by his Majesty the Emperor Alexander II to give a lecture before his Majesty, the Empress, and Court at Czarskoi Zelo, which I did, but as I wished to present to his Majesty not only my own telegraph instrument, but all the latest novelties, Professor Philip Reis, of Friedericksdorf, Frankfort-on-Main, sent to Russia his new telephone, with which I was enabled to transmit and receive perfectly all musical sounds, and also a few spoken words, though these were rather uncertain, for at moments a word could be clearly heard, and then from some unexplained cause no words were possible. This wonderful instrument was based upon the true theory of telephony, and it contained all the necessary organs to make it a practicable success. Its unfortunate inventor died in 1874, almost unknown, poor, and neglected, but the German government have since tried to make reparation by acknowledging his claims as the first inventor and erecting a monument to his memory in the cemetery at Friedericksdorf.*

The duties connected with my printing telegraph instrument prevented me from continuing my experiments with the telephone of Professor Reis; but in 1876 we heard in Europe of the invention by Professor Alexander Graham Bell of his wonderful telephone, by means of which the practical transmission and reception of human speech had become an accomplished fact, and early in 1877 the instrument was brought to England. I at once resumed my experiments of 1865 with it, and found that Professor Bell's telephone, considered as a receiver, was absolute perfection, but that his mode of transmission of magneto-electric currents generated solely by the movement of an iron diaphragm near its electro-magnet was defective, as the currents produced were too feeble for any practical use. I then tried to adopt Professor Reis' system of using a separate battery, brought into play by the movement of a diaphragm.

I will not cite the numerous experiments and difficulties that I met with in this research; but at last I succeeded in finding the effect I wished, by the use of a very slight electric contact of the surface of solid carbon, or any other metals, such as ordinary iron nails. This slight or microphonic contact has the remarkable power of varying the resistance and consequently the force of an electric current, exactly in accordance with the sonorous vibrations of the human voice; and, in fact, the contacts could easily be rendered so sensitive that the instrument became a true microphone, rendering audible sounds far too feeble for the human ear. All of these results I gave freely to the public, and brought before the notice of the scientific world in a paper I read to the Royal Society in May, 1878.

Another discovery which I made in the continuance of my researches, which is now of the highest utility to far distant telephony, was the use of twisted wires, or wires so arranged upon their insulators that the whole line should gradually revolve on its axis, so as to prevent induction from other independent wires. This was given freely to the world in my paper read before the Society of Telegraph Engineers, March 12, 1879, and fully illustrated by engravings in Engineering of the same week. In order to understand this, I will quote a single paragraph from this paper.

"If two ordinary aerial lines are thus used, they should have the twist given to these wires by changing their position relatively to other wires from vertical to horizontal at each pole or mile. Thus, if we had two lines, A and B, they should have their four relative positions repeated as often as possible, viz., A B, then $\frac{B}{A}$; then B A and $\frac{A}{B}$."

This is the system employed by the telephone line between London and Paris, and, in fact, upon all successful long distance telephone lines throughout the world, so I think it is only fair that it should be known that I discovered and published this long before long distance telephony was ever brought into use.

During the same months of 1877 that I was experimenting with Professor Bell's telephone, Mr. Edison in the United States was also engaged upon a similar research, viz., endeavoring to adopt Professor Reis' method of transmission by a diaphragm and separate battery, and he succeeded in inventing and patenting his form of transmitter, which he called the carbon telephone. This transmitter was brought to England in 1878, and it worked remarkably well, although I felt convinced then, as I am still, that the theory upon which it was supposed to work was wrong. Mr. Edison's views were that its mode of action was based upon the varying resistance obtained through a varying pressure of the diaphragm upon an elastic button of carbon. (He believed that the varying resistance of carbon by pressure was an original discovery, but it was well known for many years previous in Europe through its publication by Du Moncel and its application by Clerac in his carbon resistance tube, whose resistance was varied according to the pressure given to its adjusting screw.) The error of this theory is shown by the fact that we cannot obtain more than a difference of resistance through pressure upon any conducting substance but of a few ohms, say one to ten, but with a microphonic joint we can easily obtain the widest possible range, from almost zero to an infinity of resistance, and this with the smallest possible expenditure of mechanical energy from the diaphragm, or even without a diaphragm. I believed then, as I do still, that its excellent functions were due to a microphonic joint, of which, and of the value of which, he was unaware, and I also believe that the often successful transmission of words by Professor Reis' transmitter was due to an accidental adjustment of his contacts to a true microphonic condition. He was, of course, unaware of the power and importance of microphonic joints, else his telephone would have been a practical success at once.

Unfortunately, Mr. Edison and myself had a painful discussion as to priority of invention, in which we have both sustained our individual views up to the present time. Mr. Edison's views have been sustained by all the companies owning his patent; mine have been sustained by nearly the whole scientific world. The companies, however, whose interest it was to sustain and possess for themselves an entire monopoly, have spared neither wealth nor power to obtain this coveted monopoly, and by the means of the ablest legal counsel and expert witnesses they obtained a legal decision giving them the sole right to the use of a diaphragm pressing upon a variable resistance, notwithstanding that the diaphragm was the discovery of Professor Reis and microphonic contact by myself.

This is all now past history, but I am now more than consoled by the fact that at the present time there is not a single transmitter in practical use throughout the world whose function is not based entirely upon its microphonic joints, whether in the form of solid conductors pressing upon each other or when these contacts are multiplied, as in the form of granules or powder.

In conclusion, it gives me great pleasure to call attention to the vast progress and improvement in the telephonic system, due to the energy and enterprise of the different telephone companies. The telephone and microphone would have never reached their present vast stage of usefulness if it had not been for the establishment of the exchange system, with its complex and costly system of switchboards. This has enabled a single subscriber upon any separate line to be brought into almost instantaneous connection with any chosen subscriber out of thousands on the list. They have built the best possible of lines, and whenever possible have given a complete metallic circuit in order to avoid induction from other lines.

I beg to thank you for having so kindly listened to my few remarks, and to thank you most sincerely, in the name of your guests and myself, for the warm hospitality with which you have welcomed us here this evening.

* "Philip Reis, Inventor of the Telephone." A biographical sketch by Professor Silvanus P. Thompson, F.R.S., etc. London: E. & F. Spon, 1883.

Aztec Ruins in Arizona.

The Journal, of Los Angeles, Cal., reports that D. J. Court, a mining prospector, has returned to Prescott, Ariz., from a three months' sojourn in "one of the most remote and little known parts of the Territory, and says that that section contains more Aztec ruins than any other portion of America, evidences of human habitation being found from the highest peaks to the lowest valleys. In one place he found a road or street three miles in length, perfectly smooth and straight, and sixty feet in width. On either side of the street, the entire distance, are ruins. The road was evidently built prior to some mighty earthquake, as it ends abruptly at the brink of a mighty chasm. He dug up and found lying about a great number of skeletons, which were in a fair state of preservation, the heads of all being alike—very large over the eyes and receding, and almost flat toward the back of the head; jaws well developed, but front upper and lower teeth small and sharp. The ruins show the people to have been workers in stone, some fragments of work in turquoise being found. Every available foot of land had once been cultivated."