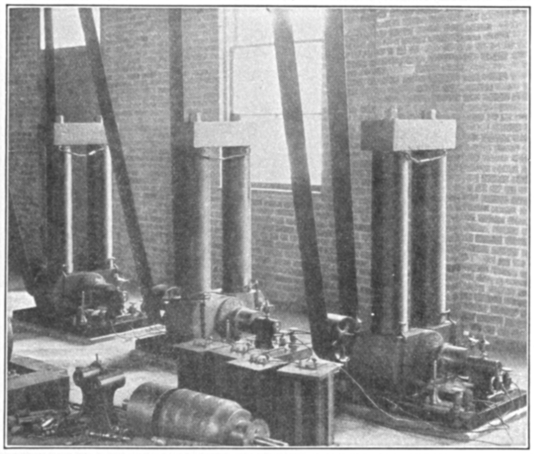
THE FIRST CENTRAL STATION AND LIGHTING PLANT

The contrast between the world's first experimental central station for domestic distribution of electricity and a modern superstation may appear great; yet we know that in the nucleus of the modest central station where embodied all the elementary features.

The fundamental principles expounded by Edison at that time have formed the basis for the aggressive technical creations that have followed.

We know that in 1878 Edison began to lay his plans for a system of electric lighting and power distribution that would be analogous to the gas system; and he eventually conceived a method that promised success in competition. The key to the door of success was a cheap, practical incandescent lamp having the candle power of the ordinary gas flame. IN addition, he must have an efficient dynamo and a flexible and constant potential system of underground conductors in which the cost of copper was not prohibitive. There were other necessary adjuncts, such as meters, sockets, fuses, switches, cleats and even insulating tape. For all of these, not the shadow of a precedent existed from which he could start.

A writer once said; 'Edison is pre-eminently a modest man and was never known to ask for more than he thought he could get'; to which the writer wishes to add that whatever Edison thought he could get, he kept after until he got it. The Herculean task he undertook to perform in 1878, which had so long baffled the world, was essentially solved in 1879, and when at last the impatient public had its opportunity to witness the first practical test, a feeling of widespread awe swept over everyone. With the exception of a few die-hards, all realized that the dream of Sir Humphrey Davy and other scientists was about to be realized.



The first central station as restored at Dearborn in the Menlo Park machine shop.

The little central station was installed in the rear of the machine shop near the glass partition separating the shop from the engine room. It consisted of three Edison generators, of the 'A' type, each capable of supplying current for about sixty 16-candle power lamps with filaments of carbonized paper. The dynamos were strung in a line, tandem fashion, and belted to a shaft form the ceiling that got its power from a belt connected with the central shafting of the machine shop.

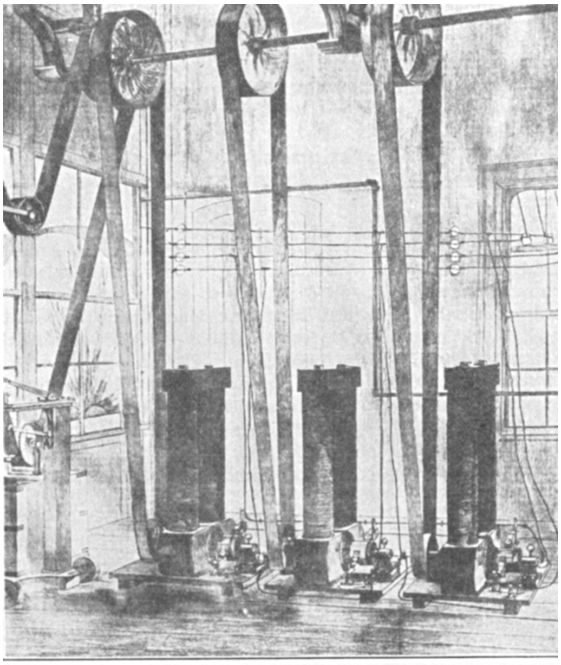
Between these two shafts (and in connection with the power-supplying belt) was a mechanical dynamometer by means of which the power absorbed by the dynamos was measured. If you will observe the accompanying illustration, you will see how the generators were mounted upon a wooden base. They had no switchboard on their yoke. Wires from armatures as well as field magnet coils to four binding posts screwed in front of each wooden base.

There was no movable rocker for holding commutator brushes. Brush holders that could be moved up or down on a vertical metal standard were used. The commutator had seventy-five bars insulated by mica; the armature shaft rested upon bearings with *only* armature and commutator between them; the pulley was outside. These characteristics together with rounded pole pieces and shorted magnet cores define the earliest models of Edison's 1879 generators. The 1880 generators, such as were installed on the S.S. *Columbia*, had pulley, armature and commutator between the bearings; a disposition which was later practiced in the construction of generators at the Edison Machine Works in New York.

The first tow generators shown in one of the accompanying illustrations delivered current. The third acted as exciter, its armature being in series with its own and the other two field magnet coils, together with a resistance box regulated by a crank handle. A loop from the exciter circuit crossed to the testing table in the research laboratory, where the resistance box was connected in series with it. At that period no convenient resistance box with a crank and steps had been designed for regulation purposes. Edison was the first to construct a resistance-regulating device with a crank handle, such as is in use everywhere today. This little contrivance reveals how Mother Necessity helped in devising the many fundamentals that make up a central station.

Edison was also the first to introduce constant potential system. In commercial service, something practical had to be designed to regulate the field magnet circuit. Plugging separate units in or out required to t use of too much floor space. The Edison resistance unit of 1879, which was bout one ohm, was made of copper wire. Bergmann & Company later manufactured these units for sale.

The little central station bus equipment was primitive; yet it answered its purpose. IT consisted simply of four heavy copper wires mounted on telegraph insulators on the wall of the machine shop, where they ran to a wooden bar nailed across the window. The wires from the tow current-supplying generators were led loosely from their respective binding posts to the tow top bus wires on the wall and connected up in multiple arc; those of the exciter machine led to the two lower ones.



Drawing of first central station as it appeared in 1879-1880.

An operation of special interest was the way in which Edison regulated machinery in the distant shop by turning a single wheel in the laboratory, one of the first instances of remote control of electric energy. Today the three generators on the restored Edison machine shop in Dearborn operate just as they did in 1879, one as an exciter and the others as current generators, the wires form the exciter being led to the laboratory testing table where the regulating is done.

Fuses were used rather liberally in installations at Menlo Park; and it was one of our stunts to show visitors the short-circuiting of a branch line, proving that if such and accident happened no harm would result, as the circuit would be cut out.

We must not forget that at the beginning everything had to be learned; for we were invading a new and unknown continent the conquest of which was derided by eminent scientists as an impossibility. 'Seek and ye shall find,' says the Good Book. That is what Edison did; and from the results of his search as typified in that humble central station al the superstations of today have sprung.

A secret of success greater, however, than the lamp was Edison's idea of the ratio of external to internal resistance. This idea opened the path of progress for all practical and commercial systems of direct and alternating current. A transformer or rotary converter is nothing more

nor less than a current receiver just as a simple motor or incandescent lamp is. He created the constant potential system.

How difficult it was for Edison to make his opponents understand this idea and how long before they did! The little central station at Menlo Park in 1879 supplied about one hundred lamps of the sixteen-candle type having filaments of carbonized paper; these were distributed among the residences, the Jordan boarding house, the laboratory buildings and the street lamp-posts; the same current also ran a small shunt motor connected with a sewing machine on the upper floor of the library. All street conductors were overhead, as were house connection and lamp-post wiring.

Of historical interest were the first lamp-posts mounted with incandescent lamps. They were of an improved design substituted about 1878 for the ugly coffin-shaped gas lanterns revealed in pictures of old New York. They new type of lantern consisted of a globe and a cover provided with an ornamental metal ventilation piece resembling and Austrian cuirassier's helmet; and incandescent lamp was placed in the globe. Posts at Menlo Park were painted white. The array presented a pleasing appearance.

The multitudes of persons who visited Menlo Park to see the incandescent electric lamps and the sewing machine working without pedals also was for the first time a high-tension circuit from a new current-distributing system. Those who were unable to come learned of the wonders through newspaper, telegraph and cable.

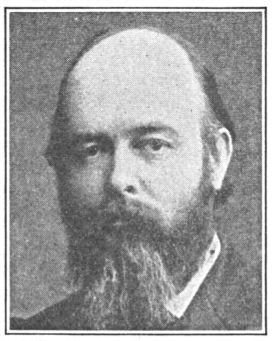
Visitors were not all idle curiosity seekers; there were also men of note and agents for interested parties. And one mane came for mischief!

That fellow had a heavy wire bridge across his shoulders and concealed under his coat. By means of the ends, which passed out to f his sleeves, he managed to produce short circuit that blew out a local fuse, extinguishing a few lamps. He was spotted immediately; for we kept a sharp lookout during exhibitions. Before he knew it he had been rushed out. Other persons were trapped trying to steal lamps and whenever caught were not dandled with gloves.

One day when thousands were there, the old frame laboratory creaked under the burden as if it would collapse. We averted disaster by regulating the number of persons allowed to enter at a time.

It is hard to appreciate the extreme difficulties Edison had to overcome before he presented his priceless gift to the world. Sir Oliver Lodge a few years ago said:

'Early pioneering work is too often overlooked and forgotten in the rush of a brilliant new generation, and amid the interest of fresh and surprising developments. I often think that the early stages of any discovery have an interest and fascination of their own, and that teachers would do well to immerse themselves in the atmosphere of those earlier times, in order to realize more clearly the difficulties which had to be overcome, and by what steps the new knowledge had to be overcome, and by what steps the new knowledge ad to be dovetailed in with the old. Moreover, for beginners, the nascent stages of a discovery are sometimes more easily assimilated than the finished product. Beginners need not indeed be led through all the controversies which naturally accompany the introduction of anything new; but some familiarity with those controversies and discussions on the part of the difficulties. For though he does not himself feel them now, the human race did feel them at its introduction; and the individual is liable to recapitulate, or repeat quickly, the experience of the race.'



SIR OLIVER LODGE

Sir Oliver Lodge was both humanly and scientifically correct. Let the teacher explain to his students how Edison attained his fundamental objectives. Let him show the common sense of Edison's methods and the practical results produced, extraordinary advances in science though disputed on every hand by men who thought they know more than he.

The Edison incandescent lamp, the Edison dynamo, the Edison system of energy distribution for light, power and heat, form the exalted basic constituents of an art that has stood the test of more than half a century in all quarters of the globe – of an order that from the start has been universal in its service to mankind.

In Menlo Park at Dearborn may be seen the actual apparatus used in the great master's first

demonstration of an electric light plant in 1879-80. Here you may see that first central station, that system of distribution and even those carbonized paper horseshoe lamps just as they were in the exciting days of ‘79-’80. Then again the most thrilling sight of all is the starting of this machinery in actual operation, when once more may be seen little paper incandescent lamps diffusing a mellow glow. A feeling of rapture carries you into the historic past where, under the enchanted spell of surroundings in the midst of which you have been magically placed, you come into mystic touch with Edison himself!