THOMAS ALVA EDISON.

With the commercial introduction of a radically new type of storage battery, public attention is again drawn to the man who has done more than any other in our time to apply electricity to the needs of every-day life. There is not an electrical instrument, or an electrical process now in use, but bears the mark of some great change wrought by the most ingenious of Americans.

Some brief account of Thomas A. Edison, as an inventor and as a man, may not be without interest to the readers of a journal, many of whom are themselves inventors. To those who believe that Edison's work is the product of an inspiration given by nature to but few, the story of the manner in which he achieves success will seem shockingly unromantic. In the genius who works by inspiration Edison has no great faith. "Genius is two per cent inspiration and ninety-eight per cent perspiration," is the incisive, epigrammatic answer he once gave to a man who thought that a genius worked only when the spirit moved him. Yet it must not be supposed that Edison is deficient in imagination. Every great inventor must have something of the poet in him; for without a most lively fancy, he could never see the possibilities of his own creation.

If the limits of this article permitted a discussion of Edison's numerous inventions, the characteristic of commercial utility would be found common to them all. Not being given to scientific rhapsodies, Edison does not concern himself with what may be of service a century hence; he confines himself rigorously to the needs of the present.

Knowing full well that he is probably not the first who has set for himself the task in the performance of which he is engaged, he reads all that is pertinent to his subject in the vast library which forms an important adjunct of his laboratory. Not content with the information gathered from his own shelves, his literary agent is ordered to send him more. If one were to examine a certain revolving bookcase in Edison's study at home, one could foretell what electrical problem is soon to be solved in the Orange laboratory; for in that case are always contained the volumes which interest him most at the time.

After a thorough review of his subject, Edison begins laboratory work—an expert keenly alive to the failures of his predecessors, careful to avoid useless repetitions of old experiments. It is now that the two per cent inspiration gained by exhaustive reading, and the ninety-eight per cent perspiration which he is ready to expend, are applied. Experiments are made; not a few, but hundreds and even thousands. Model after model is built. Failure upon failure is met with, until further effort seems hopeless. Undismayed, Edison performs more experiments, builds more models. Failure spurs him on. At last an experiment is performed or a model made which gives faint encouragement. So far from being elated, he regards the promising result with great suspicion. The failures have been too many; the apparent success after all may be due to an accidental combination of circumstances that may never occur again. Only after the partial triumph has been confirmed by many trials does complete assurance come.

If ever an Edison invention was a product of infinite pains and unflagging pertinacity, it was the electric incandescent lamp. He had read all that could be read of the labors of others to provide a more efficient light. He knew of Starr's work in England and of Draper's in New York with the platinum wire. He had studied what Despretz had done with sticks of incandescent carbon contained in a glass globe exhausted of air and filled with nitrogen. He knew all that was worth knowing of illumination by means of incandescent carbon inclosed in a vacuum. Then he set his wits at work to find out why everyone had failed. Early in the spring of 1877 he began to experiment. First he thought that a carbon filament might be made out of cotton thread. Five hours were spent in carbonizing a thread. The frail black filament obtained crumbled at the touch. Attempt after attempt proved hopeless. At last a carbonized thread was rescued intact from the furnace; and that, as bad luck would have it, broke in the mounting. For days no further progress was made. He locked himself and his assistants in his laboratory, vowing that neither he nor they should open its doors until he had produced an operative incandescent lamp. After repeated mishaps and incessant testing, a lamp was completed which burned for days before its light expired. Then, and not until then, did he and his laboratory assistants rest. Every imaginable substance was now tried in the effort to devise a perfect filament—iridium, platinum and all the metals, threads rubbed with coal tar, plumbago, South American fibers, monkey-bast fiber, Manila hemp, South American bast, whitewood, palm leaf, paper of all kinds, jute, cardboard, bamboo, and a host of other substances. After thousands of tissues and threads had been tried, it was finally determined that vegetable fibers produced the best filaments.

He had now to determine what vegetable fiber best suited his purpose. A man was dispatched to China and Japan with orders to test the native bamboos. Another explored the Amazon for fibers, suffering untold hardships and tasting no meat for a hundred and sixteen days. A third was sent around the world, with instructions to search Ceylon in particular, from the north to the south and from the east to the west. The whole globe was scoured. Finally the explorers brought back some eighty varieties of bamboo and three thousand specimens of vegetable fibers. Of all these, only three or four were found available.

Trial after trial was made to determine what shape of bulb should be adopted; what particular quality of glass should be used; what was the most effective way of exhausting the air, and what was the simplest method of sealing the bulb. And even after these tasks had been performed, it was necessary to devise a means of generating a current of the proper character.

In all this there is no guessing, no trusting to luck. Edison knows exactly what he wishes to accomplish, and how his end is to be attained. Absolute certainty of purpose and of method saves him from frittering away his time in useless experimentation. Chance has given perhaps an occasional idea, but it has not lightened his work. A device, whose invention he himself has attributed to accident, is the phonograph. He had taken out a patent on a telegraph repeater, in which a chisel-shaped stylus indented a sheet of paper curled around a cylinder. These indented marks were to be used in retransmitting the recorded message. "While singing into the mouthpiece of a telephone, the vibrations of the voice sent the fine metal point into my finger," he tells us. "That set me to thinking. If I could record the movements of the point and send it over the same surface afterward, I saw no reason why the thing would not talk. I tried the experiment first on a strip of telegraph paper. I shouted 'Hello! hello!' into the mouthpiece, ran the paper back over the steel point, and heard a faint 'Hello! hello!' in return." Then he decided to make a talking-machine. The men in the laboratory laughed at him. In the end he proved that he was right.

When the first operative phonograph was completed, Edison packed up his instrument and came to the office of the SCIENTIFIC AMERICAN. Without ceremony he placed the machine on the Editor's desk and turned the crank. The machine introduced itself. "Good morning," it said. "How do you do? How do you like the phonograph?" And thus it happened that the Editors of the SCIENTIFIC AMERICAN constituted the first public audience that ever listened to the phonograph.

The story of the incandescent lamp is repeated in Edison's invention of a method of electro-magnetically concentrating ores. The system has been so fully described in these columns that a detailed description is hardly necessary.

About the latter part of 1897 Edison devoted his exclusive attention to the invention of a new storage battery, on which problem he had been engaged for some five years. For over a year he worked harder than a day laborer. He was at his laboratory at half-past seven in the morning. His luncheon was sent to him. In the evening he left for dinner, but returned at eight. At half-past eleven at night his carriage called for him; but often the coachman had to wait for three or four hours until the inventor came out of his laboratory. Yet despite all this labor, no apparent progress was made for months.

When vacation time comes, and with it a chance to leave his laboratory, Edison plays just as he works, with his whole heart and soul. He will hear nothing of business. Science is thrown to the winds. Letters sent to him from the works are utterly disregarded. Only a telegram of the most imperative nature will command his attention. And so it is with the little relaxation which he permits himself during his work. His hours of rest are few; yet his short sleep is sounder and more refreshing than that of many whose enterprises are of less pith and moment.

Of Edison's personality much might be written. When you meet him for the first time, you feel immediately at your ease—he is so unaffected and cordial. Then, if you are a newspaper man, you begin to study him out of the tail of your eye. He is neither tall nor short, stout nor thin. His white hair makes him seem older than he really is; he is only fifty-six. His face is clean shaven—the mouth firm, the chin strong. In his dress he is careless to a degree. If you are fortunate enough to have him pilot you through his laboratory, you will find it no easy matter to keep up with his quick step. He is nervously active; everything he does is done quickly, yet not hastily. He explains things tersely and clearly. You talk to him; you notice that he is somewhat deaf, and you wonder why this man of all men, should not resort to some invention that will enable him to hear better. But he looks upon his deafness not as a misfortune. Eminent specialists have told him that he can be cured; but he has assured them that he prefers not to be treated, arguing shrewdly that if he could hear the noises which have been so long muffled, he might find it more difficult to concentrate his mind on his work.

Some day a patient Boswell will lovingly intersperse in the chronicle of Edison's life-work many a tale of his delicate sense of humor. If there is one thing that Edison loves, it is a rollicking story. Many a black hour in the laboratory has been brightened for his assistants by his keen wit and sparkling repartee. Occasionally the outer world hears his scientific opinion expressed in some playful sarcasm. When asked once by a New York State official what was the best method of electrocuting murderers, he gave vent to his deep-rooted opposition to capital punishment in the bantering retort, "Hire out your criminals as linemen to the New York electric lighting companies." Then he began an exhaustive investigation which finally revealed the quickest and most painless method of electrocution. Every man in the laboratory who hears a good joke or a clever remark feels it his duty to repeat it to the "Old Man," as Edison is affectionately called in the shops.

His laboratory and his plant are not so much a place of business as a school of scientific invention, of which he is the master. Indeed, he has ideas of business which a Wall Street man might charitably call eccentric. Nowadays his business affairs are conducted by able men. But in the days when he built his first plant at Newark, and when the actual work of keeping accounts devolved partly on him, he conducted his financial affairs in a picturesque, nonchalant way. "I kept only pay-roll accounts, no others," he assures us; "received the bills, and generally gave notes in payment. The first intimation that a note was due was the protest, after which I had to hustle around and raise the money. This saved the humbuggery of bookkeeping, which I never understood. The arrangement, besides, possessed the advantage of being cheaper, as the protest fees were only one dollar and a half. Notwithstanding this extraordinary method of doing business, everyone was willing to accept the notes and my credit was good." The hours of work were just as erratic. "We had no fixed hours, but the men, so far from objecting to the irregularity, often begged to return and complete certain experiments, upon which they knew my heart was especially set."

Like all successful men, Edison has his enemies. He has been accused of appropriating the work of others as his own. There is a rumor abroad that he employs a number of brilliant young men, whom he pays handsomely to work out his ideas, and that it is they who really ought to be credited with the invention of many devices that bear his name. That he is dependent to a certain extent upon the help of assistants is undoubtedly true. Nature has given him but a single pair of hands and a single head. In his laboratory the help which he receives consists largely in the performance of tasks too multifarious for a single man. Something more than a bare idea to work with is given to each man in the laboratory. He is told exactly how the result desired is to be attained. In other words, the men in the laboratory are intelligent human tools in Edison's hands. To him alone is due the invention of the many contrivances with which his name will ever be associated.

The Current Supplement.

The current SUPPLEMENT, No. 1408, opens with a description of some electric freight locomotives. By far the most important article in the number is the first of a series of installments by the English correspondent of the SCIENTIFIC AMERICAN on water-tube boilers. The French revolutionists provided the world with a decimal system of weights and measures, but they were not farsighted enough to provide a decimal system of time. The problem of extending the decimal system to the measurement of time has been taken up by M. De Sarrauton who has devised a most ingenious decimal registering chronograph described in the current SUPPLEMENT. Mr. E. H. Foster tells much that is of value on superheated steam. The Ionic volute has for centuries been an æsthetic mystery to architects. How it was formed has never been quite discovered. F. C. Penrose gives some information on the origin and construction of the volute. Some types of French electrical elevators are described in an article that will be found of interest to engineers familiar only with American practice. Another electrical article of some importance is Mr. G. Paul's study of surface contact systems. "Modern Methods of Underground Wire Rope Haulage" forms the subject of an entertaining article.

It has been unofficially stated that at the approaching automobile show, to be held next month (January), the storage battery of Thomas A. Edison will be shown in its completed form, and it will be announced that the device is ready to be placed on the market commercially. Three machines equipped with these batteries have been in daily operation on the roads of New Jersey, around the Edison works, for some time and one has done a century every day.

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