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STANLEY'S MACHINE GOES TO MUSEUM

Noted Engineers Honor Great Inventor

135 AT BANQUET

Speeches By Russell Rice, Thompson & Others

SPRAGUE & SEN. DAWES

Pittsfield Journal

In Pittsfield, home of the transformer, which has for over 20 years occupied a unique position in the electrical world, in the fourth annual dinner of the Pittsfield branch of the American Institute of Electrical Engineers last night at the Wendell, the silver anniversary of the commercial birth of the transformer was fittingly celebrated while such honor as is seldom paid to living men was paid William Stanley its inventor by the leading electrical inventors of this country and his friends.

There, too, before the dinner closed, the prototype of the transformers of the present day that daily change the aspect of the world was presented by William Stanley to the American Institute and it is to be preserved in the museum of the New York (central station) a priceless heirloom.

This little transformer built by Mr. Stanley occupied a position on a small table beside the center of the guest table and immediately in front of the toastmaster and the honored guest of the evening. No idol was ever more greatly honored than this little machine that has so changed the world.

There 135 men keenly interested in electrical science and engineering after enjoying a fine dinner, to which Landlord Minahan gave his personal supervision, had presented to them by pioneers in the electrical field a moving picture of the whole realm of commercial electricity in fact the whole field of electrical science and its development.

It was 8.15 when the engineers sat down to the following menu.

THE MENU

MARKED EPOC[H] OF ELECTRICAL

William Stanley by Inventing His Transformer Lifted Subject Out of Realm of the Speculative and into Realm of the Commercial, Declared Prof. Jackson.

Elaborate Program Carried Out at Wendell in Commemoration of Silver Jubilee of Stanley Transformer—Mr. Stanley Tells of His Early Experiments.

Berkshire Evening Eagle

Some of the most prominent pioneers in electrical development in America were among those to assemble at the Hotel Wendell last evening to participate in a dual event, the fourth annual banquet of the Pittsfield branch of the American Institute of Electrical Engineers and the celebration of the 25th anniversary of the successful operation of the first transformer ever used commercially in this country. Its inventor, William Stanley, was the guest of honor during the evening and also the principal speaker. He spoke very entertainingly of the invention of the transformer so famous in electrical annals and told of the installation of the first commercial plant in this country in Great Barrington.

The toastmaster of the evening was Prof. D. C. Jackson, president of the American Institute of Electrical Engineers and professor of electrical engineering at the Massachusetts Institute of Technology. Other speakers were [illegible]

The banquet was held in the main dining room of the hotel and the room was comfortably filled. The speakers' table was embellished with beautiful bouquets of roses while in front of this table on a smaller table rested the famous first transformer invented by Mr. Stanley. Escher's orchestra was ensconsed in the southwest corner [of the] room and discoursed very cat[chy music] during the evening.

CHAIRMAN BLAKE'S REMARKS

At the conclusion of the repast, the postprandial exercises were taken up. Chairman S. H. Blake of the Pittsfield section extended a few words of welcome and then introduced as the toastmaster of the evening Prof. Jackson. Mr. Blake said in part: In behalf of the Pittsfield section I wish to welcome the distinguished guest we have with us this evening. We are here to do honor to a man who did so much pioneer work and so much to develop the electrical industry. This is a red letter night of the Pittsfield section, it being the end of the year's active work and the fourth annual dinner of the section combined with the celebration of the silver anniversary of the commercial installation of the alternating current transformer.

President Blake also announced that regrets had been received with sincere congratulations for the guest of the evening. During the dinner a congratulatory telegram was read from Dr. Edward Weston. Regrets were from the following:

Prof. Jackson then assumed the duties of toastmaster which he performed in a very gracious and effective manner throughout the evening. As an introduction to Mr. Stanley's address which was to follow, Prof. Jackson spoke briefly of the early days of the electric magnetic induction, passing over the work of the early pioneers in that line in this country and abroad and bringing the subject down to the time when Mr. Stanley perfected his transformer. ~~In conclusion Mr.~~ Jackson said that Mr. Stanley had lifted the subject out of the realm of the speculative, where his predecessors had left it and placed it in the realm of the commercial; he had breathed on the dead bodies and brought life to them.

MR. STANLEY'S ADDRESS.

He then introduced Mr. Stanley who took as his subject "Our First Alternating Current Plant and How It Started," and spoke as follows thereon:

Gentlemen:—We are gathered tonight in remembrance of an engineering experiment that took place 25 years ago in the neighboring village of Great Barrington, which, if I correctly estimate the history of the subject, marks the birth of alternating current engineering in this country.

There seems to be a general law in the development of the arts, that, as knowledge accumulates and passes from the pure scientist into the possession of engineers and inventors, new ideas simultaneously form in many minds which result in the production of the same invention by several people contemporaneously, with inventions and improvements in the art are therefore, the result of accumulated knowledge as well as personal imagination.

So far as I know there was little competition in the development of the alternating transformer system in America. But there were two workers abroad who devised alternating current systems about the same time we took the subject up in this country. I am not proposing to discuss priority in these matters. Surely the art that has arisen during the last 25 years has borne fruit sufficient for all—and I should have been content to have left the subject without discussing my personal relation to it, but that there are many young men now interested in it who seem to wish to know how it was started. With your permission, therefore, I will attempt to give a very brief sketch of the status of electrical engineering, as it appeared to me in 1883, that is, nearly 30 years ago.

The prominent workers of those days in the electrical field were Mr. Edison, Mr. Brush, Dr. Weston and Prof. Thomson. They were all occupied with continuous current problems.

The Brush arc-light overran the land, the Thomson-Houston and Weston systems pressed eagerly after it, Mr. Edison had his two wire and three wire systems well started. The Maxim Weston & Swan companies manufactured incandescent lamps. The country abounded with competing promoters and self styled inventors, who with few exceptions, have disappeared. These gentlemen confined themselves to the design of arc lamps mechanisms, switches, sockets and wiring paraphernalia and a number made considerable fortunes from their work. Among the men, however, who seriously looked forward to the extension of the art, there was grave anxiety as to how, in what manner, electricity should be distributed over large areas at a reasonable plant cost—for simple calculations showed, that while the area that could be covered by 110 volts service, say one square mile, was extended to, say 16 square mbiles—by the three wire 220 volt plan, yet the conditions necessary for these results were rarely found in practice and therefore, the more thoughtful and far seeing engineers realized that some new system of distribution was desirable. Now the Edison-Hopkinson three wire system plainly disclosed the economy of high potential distribution, consequently, engineers the world over studied and suggested variations of this plan.

Dr. Weston brought out the series multiple system in which arc light dynamos of high potential, say 1000 to 2000 volts, and constant quantity of current fed incandescent lamps arranged as in figure 1, where the squares represent automatic switch boxes that cut in resistances when the lamps were cut out. Brush brought out a very complete system of distribution employing storage batteries in place of resistance boxes as shown in figure 2, where the batteries were floated across each pair of local distribution mains while an automatic switch cut them out of circuit when fully charged. This system, although ingenious and attractive, failed, however, to meet the broadening demands for a general supply service and disappeared.

Later, Gaulard, a Franco-Italian engineer and inventor, and Gibbs, an English promoter, advocated under the title of Gaulard & Gibbs the use of induction coils energized by alternating currents. Our patent records disclose that long prior to Gaulard & Gibbs' entry into the field,the same arrangement was suggested by Jim Billings Fuller of this country (in 1878. So far as I know,however, no attempt was made by Fuller to put his conceptions into practice, and we can hardly consider him to have been a pioneer in the art, as his disclosures, like those of Gaulard, were founded on a misconception of the engineering requirements and were practically useless. It has been customary to herald the Gaulard & Gibbs disclosure as an epoch making event. Let us look at the subject fairly and see what they actually did do.

Messrs. Gaulard & Gibbs (in 1885?) exhibited their system in the Grosvenor gallery—installation in London. This system consisted of a Siemieus light house alternator designed to give an alternating current of constant quantity, (16 amperes), if I remember it correctly; connected as shown in figure 3, where a number of "inductoriums" or induction coils) primaries are arranged in series while their secondaries were connected to incandescent lamps (arranging parrallel and to a resistance regulator, which, if lamps were out of circuit, varied the value of a substitution resistance, thus keeping the load approximately constant. The inductoriums, as they called them, were made with iron wire cores about 1½ inches in diameter and of the same length as the coils. The magnetic circuits were of the open circuit type and the transformation ratio was 1 to 1, or 1 to 2.

Gaulard & Gibbs' invention according to their statements to me, (and to the patent office), consisted in winding coils of high mutual induction by forming the primary and secondary windings of flat copper punchings with lips or ears upon them by which alternate punchings could be soldered together to produce interleaved or sandwiched circuits per turn of conductor, their internal resistance was high.

Messrs. Gaulard & Gibbs appear to have overlooked the beautiful self-regulating properties that induction coils in parallel connection possess. In their arrangement the primary and secondary voltages were equal, or nearly so. The primary current approximately constant, the regulation they affected, was due in part to phase displacement of the primary current, and in part to an automatic regulator placed in the secondary circuit of each transformer.

As I remember it, Gaulard & Gibbs at first limited their claims to construction improvements in induction coils, but later, after the Great Barrington plant was operated successfully, at the suggestion of their American licensee, they applied for broad patents covering the distributing of energy by alternating currents which, however, upon careful investigation, the United States courts did not sustain.

We are, however, indebted to them for their efforts, for while they misconceived the engineering requirements and added nothing permanent to the art or apparatus that has finally solved the problem, their work drew attention to the possibilities of alternate current engineering.

SOLVED PROBLEM.

Quite different was the work of Zipernowki, Deri & Blathy, three distinguished engineers of the firm of Ganz & Co. of Buda-Pesth looking back upon their work from our present vantage ground, we can only sympathize with, and admire it. Ganz & Co. exhibited at a local fair in Buda-Pesth a system employing alternators wound for a constant an high, potential induction coils, designed to be connected by their primary circuits to high potential mains and wound short and therefore, low potential secondaries,to which lamps were connected, in fact they disclosed the alternate current system as we use it. Their transformers were made with closed magnetic circuits, were intellidently designed, and properly constructed. If the work leading up to the Barrington plant had not been undertaken and if the plant had not been built, we would still have had the system from Buda-Pesth without essential modifications. Zipernowski, Deri & Blathy published in October, 1885, a description of their work in the English Electrical Review.

I am glad to bear testimony to the work these distinguished men and eespecially for the reason that Americans have been inclined to give credit to the work of Gaulard & Gibbs which, in my opinion, it was not entitled to, and in which Zipernowski, Deri & Blathy should fairly claim a pioneer share.

THE GREAT BARRINGTON PLANT

I now come to the work that led up to the Great Barrington plant. I am not accustomed to speak of my own efforts; they are generally not worth talking about so I am at a loss to know how to begin. In turning back among the few old records that escaped the Brookside fire, I find one or two in 1883 tnat gave me a little encouragement. In September 18th, 1883 my note book shows a sketch and entry as follows:—

"A system of multiple series translating devices, each series having an opposing E. M. F. shunt in combination with an alternating current dynamo electric machine, a system of multiple series translating devices--an alternate current dynamo-machine or more than one working in electrical unison and opposing E. M. F. shunts across said translating devices." And again in December 18th '83.

"An alternate current generator and a series of coils AAA having iron cores BBB adapted to be attached to the translating devices shown at C so that the main circuit from the generator G shall be electrically insulated from the work circuit CCC and these circuits shall be fed by induced currents generated by A.

LITTLE DATA AVAILABLE

At this time, '83, I was deeply interested in the Brush system, shown in figure 2, where storage batteries delivered or determined the E. M. F. upon the consumption circuits and, as many complaints and difficulties arose due to battery troubles, it occurred to me to substitute the E. M. F. induced by alternate currents for the battery E. M. F's and while my notions of alternate current phenomena were doubtlessly hazy, and my theories often wrong, still, I worked out alone and to my own satisfaction, a definite physical conception of, what I then named the "Counter electro-motive force of self induction."

It is dif[illegible] for men of the present day to appreciate the conditions of that time. Please remember that there were few books on electrical engineering, no formulae, except those hidden away in scientific papers, there was hardly a scrap of information about alternating current phenomena available. Years earlier Moses G. Farmer had experimentally built one or two alternators, Lontin in France, and Seimeins in England, built a few alternating arc lamp machines, probably a dozen or so. Gordon in England, built a monster alternator. All the machines except Seimeins'. failed for one reason or another and there was a popular opinion that there was nothing in the alternating current field. It therefore took definite self conviction to believe that the solution of the distribution of energy problem lay in this despised and rejected line of work. At this time, the laws of the magnetic circuit were not generally understood or accurately defined and it was difficult to find an engineer who had a clear, clean, definite and easily applicable conception of the subject, so when I began studying induction coils the phenomena that appeared were striking novel and interesting, and to me at least, it was only possible to have a physical conception of these phenomena, not a quantitive estimate of them.

I only mention the references quoted above from my note book to show that in 1883 I was seriously thinking of the distribution problem, in fact it haunted me, lack of money and opportunity delayed my going ahead with the work at that time.

Early in 1884 I made a co-operative arrangement with George Westinghouse which took me to Pittsburg—this was before the organization of the Westinghouse Electric company—where for a while I was swamped with work in other lines. During this busy year (1884) I was carrying in my mind the old problem of distribution. It had become my problem now, my one secret ambition, if I may confess it. Several times during the year I thought to get at it, but could not, until fall as I had no alternator at hand I wasted a good deal of effort in attempting to convert continuous to alternate currents by a special form of induction coil having two opposite wound primary circuits, one secondary, and a commutating device—my idea was to send the current from a continuous current source, first through one primary in a given direction, next through both primaries in opposite directions and lastly through the second primary in a direction opposite to the first and so reverse the magnetization. It worked, some, but oh how it sparked. I tried to console myself with the thought that so did the Brush and Thomson-Houston machines but whenever I ran the "lighthouse," I was blue for a week. I used to shudder at the thought of meeting a future customer who had a "lighthouse" in his cellar.

I fell still lower, however, I designed a convertor in which a pair of brushes were revolved about a Gramme commutator and a Gramme wound ring(parenthetically let me state that this experiment generally precedes permanent mental derangement.) Yet this work yielded several important and useful results. In experimenting with the "lighthouse" I observed the importance of the closed magnetic circuit in reducing the intake (magnetizing) current and convinced myself that if the commutating difficulties were disposed of the system would solve the problem. I don't know that I would go quite so far now.

By the spring of 1885 my health gave out, there seemed to be a grave question as to my ability to withstand Pittsburg and its work. My doctor began advising that I go to the country. I was rather discouraged for the surroundings were uncongenial the work hard and the results meagre. At this time, I had as I view it now a useful knowledge of some of the more prominent AC phenomena.

One day when the "lighthouse" was worrying me Mr. Westinghouse told me that he could get, or had taken, an option on Gaulard & Gibbs' work and suggested that he send for their alternator (a Seimens machine) and their induction coils. I told Mr. Westinghouse that I did not think the system commercial, but that I appreciated its coming and particularly the alternator, that I believed that if induction coils were wound for parallel instead of series connections as used by Gaulard & Gibbs, that the distribution problem would be solved, that each coil would operate independently of the others, would be self regulating, both as to E. M. F. and current and be free from the variations of E. M. F. due to series arrangement.

GAVE CLEARER NOTION.

The study and effort I had given to the development of my commutator transformer cleared and defined my notions. I realized that if we could make a transformer that would regulate the energy transformed by slight variations of its induced counter E. M. F. in the same manner, that a shunt wound motor regulated for energy transferred by variation of its rotational counter E. M. F. the problem would be beautifully solved. I thought I saw this analogy or similarity, faintly at first, but soon strong and clearly. I was very much excited by it. It seemed too simple and too easy to be true. I was almost afraid to believe it at first, for I had had a good many disappointments and was in a very nervous condition, but as my convictions grew and strengthened I gained courage. Then I knew that the solution was found. I told Mrs. Stanley and although she did not understand a word about it, she knew it too.

At this time Frank Pope was a conspicuous and important factor in electrical engineering matters. He was also adviser to the Westinghouse nterests. Mr. Pope was an old time telegraph engineer and his knowledge of alternating phenomena was drawn from "kick back" effects found in coils carrying telegraphic currents. I made a deliberate campaign to convert Pope to my conception of the importance and usefulness of the variable counter E. M. F. developed in induction coil, in regulating under load variations, the energy transformed. I pointed out to him the similarity of the parallel connected transformer to the shunt wound parallel connected motor. I waxed eloquent. I tried my best to picture the phenomena clearly. Pope's conviction came slowly, more slowly than my impatience could stand. He pointed out that if high potential primary circuits of 500 or more volts were used in each induction coil, there was a grave fire, and life, danger and he held back and did not at first approve of my plan.

DEAL WITH WESTINGHOUSE.

For this reason I suppose, Mr. Westinghouse hesitated to furnish money for me to experimentally prove my views and for a moment I was at a loss to know what to do. I had a little money in electric shares and, finally, I made a trade with Mr. Westinghouse. I sold him part of my shares realizing about $12,000 and agreed to use the funds so obtained, in experimental work for the company's benefit. This arrangement now seems a trifle one-sided but I suppose Mr. Westinghouse was doubtful of my success and therefore did not feel justified in putting up the money. For my part, I feel that I made the best bargain of my life for with the enthusiastic approval of the one who never hesitated at taking a chance, the one whose courage never failed we packed up our few belongings, and shook the dirt of dreadful Pittsburg from us and hastened to the green hills of Berkshire to build a laboratory and succeed or perish in our work.

Before leaving the smoking city I designed several induction coils, or transformers as we now call them, for parallel connection. One is here before you. It was designed in the summer of 1885 and made to fit the Siemens' alternator of which I will speak later. Several other coils were constructed for experimental information one with a variable air gap in the magnetic circuit and several with iron wire cores.

During the summer months I was too indisposed to work but when the cool August nights came on my health came back and I started in to equip my laboratory.

In the north end of the village of Great Barrington was an old deserted rubber mill. This I leased for a trifling sum and erected in it a boiler and engine of 25 horse power that I purchased.

I have frequently met, in a long and stormy life, serious and obstinate difficulties, but I have never encountered any mechanism of any kind whatsoever, that possessed so profound a genious for going wrong as this engine. My engineer once offered to bet the engineer of the woolen company $10 that my engine could pump all the steam and water from their battery of boilers in 20 minutes, and I believe, that if he could have kept her going for that time, he would have won. After about a month's work we synchronized the power plant (got the pump injector, boiler and engine to agree to work on the same day.

The designer of this engine is probably dead, I hope so. I further hope that he will stay dead. There was a brief period when the Westinghouse company attempted to enlarge my alternators from 500 to 1500 lights capacity, without changing the patterns, that I thought that they had employed or resurrected him—but I digress well, we equipped a very, very simple laboratory, we had a couple of Siemens' dynameters, a tangent galvanometer, a bridge and two Cardeu voltmeters, my old balance and a few pieces of laboratory equipment. I now started to build a number of transformers and engaged Ralph Taylor of Great Barrington to canvas the town for light customers. Taylor succeeded in getting about a dozen customers to take our light and under his direction I had the stores and offices wired up.

Before this time the Gaulard & Gibbs' appartus arrived in Pittsburg. It was erected there by Shallenberger, who succeeded to my position on my withdrawing to go to Great Barrington. Our art has had few men of the ability, capacity and energy of Shallenberger. He left us many years ago, but not before he placed the impress of his character upon his work. I visited Pittsburg and operated the Gaulard and Gibbs' system.

The Siemens' alternator was designed to run at 133 cycles, to give a constant current of 16 amps. and maximum voltage of 600 volts, (which it would never do). Having a high armature inductance it was very sensitive to load variations.

GOOD DEAL OF JOKE.

The Gaulard & Gibbs' transformers I

have already described. To me they were always a good deal of a joke, or at least they reminded me by some indefinite analogy, of a quack doctor's laboratory, but they ran the lamps specified, and if the human race did not have the unfortunate habit of turning off lights when they did not want them, the system might have been used somewhere. I know of no such attempt, however, so that after a preliminary trial the inductoriums, name and all, were boxed up and are still boxed so far as I know.,

The little transformer before (built in Pittsburg) was completed when I was quite ill. It was first operated at Pittsburg on the Siemens' alternator where its self regulating properties were measured and determined. I believe it is the first transformer built in America to automatically self regulate and that it is the prototype of all transformers since made. With this transformer the following noved predictions were proven:—

First—The primary current was practically obstructed when the secondary circuit was open.

Second—The primary current was practically proportional to the secondary current.

Third—If the primary E. M. F. was kept constant the secondary E. M. F. was nearly constant with variations of load.

Fourth—By its use as a potential reducer, the loss of energy due to distance was practically obliterated.

Thus, this little device demonstrated that a system had been found possessing all the advantages of the simple parallel system and capable of distributing electricity over an enormously extended area.

LIGHTING GREAT BARRINGTON.

A number of tests were made at Pittsburg on the other transformers I have mentioned as being constructed for experimental information and then the Siemens' machine was shipped to Great Barrington to become acquainted with my engine. At Barrington two white No. 8 Underwriters' wires were run from the rubber mill to the village center about half a mile distant and two smaller pressure wires were run back from the distribution center to the station, the insulators were fastened to the great elms of the village street, then the transformers we made at Great Barrington were connected in multiple to the mains, they were usually located in the customers' cellars, and last of all the secondaries of the transformers were wired to the lamps.

We built at the Great Barrington laboratory in all—26 transformers—10 of which were sent to Pittsburg to be used in a demonstration plant between Pittsburg and East Liberty. This (East Liberty) plant was operated in the fall of 1886 as I remember it. We used in the the town plant at Great Barrington two 50-lighters and four of 25 lights capacity. The remainder were used in the laboratory for experimental work. Of the 26 transformers built, one short circuited on test. The transformers in the village lit 13 stores, two hotels, two doctors' offices, one barber shop—the telephone and post offices—the lamps were of 150-50 and 16 C. P. sizes. The length of the line from the laboratory to the center of the town was about 4000 feet. At this time I called my induction coils 'converters.' coining this telephone and post offices—the lamps were of 150-50 and 16 C. P. sizes. The length of the line from the laboratory to the center of the town was about 4000 feet. At this time I called my induction coils 'converters,' coining this name for them it was adopted generally. I really did not quite like the name—so one day in 1886, I asked my friend, Frank Hosmer, our local scholar (now Senator Hosmer) to come to supper—when I explained the action of a 'convertor' to him, and asked him to improve the name—he suggested that convertor implied a conversion of one thing to another kind of thing, but that transferro was more applicable to my coils. I however, hung on to 'convertor' until later, in England, I believe, they adopted the change Hosmer had suggested to me.

(List of Customers—Number of Transformsers made etc.

At the station (rubber mill) a transformer wound to boost the potential from 500 to 3000, a second transformer to reduce from 3000 to 500 volts and a third to reduce from 500 to 100 volts were installed. Lamps connected in series across these voltages gave voltmeter evidence that these transformations were really performed. A small transformer reduced the pressure line voltage to approximately 100 volts for the Cardue voltmeter. A good many tests on the transformers built at the Barrington laboratory were also made, and a number of weeks elapsed before we were ready to start our town circuit. In my record book of that time I find a note that the town circuit was not started up until March 6th. Long before this time I knew the system was a success. I felt sure that we would have engine trouble and we did and I knew that it would be necessary to watch the voltage of the Siemens' alternator to prevent great variation in the lights, but, broadly speaking, the system had vindicated itself. It was the right plan—so we had a gala night at last—the streets and stores were crowded with people, the big 150 candle power lamps were running at about double candle power and my townsmen rejoiced with me.

This rough sketch of one of the Barrington transformers is made from dimension data recorded at the time of its construction; it illustrates one of our 50 lighters. The coils were wound of double cotton covered wire shellacked. The H shaped cores were at first bolted together and the coils wound on—between each layer of wire was shellacked paper or cloth, next the bars were put in. We had a good deal of trouble with the bars until we finally adopted another form of core. The iron was ferro type iron, quite thin, which cut our fingers badly—tissue paper was pasted on one side of each core plate. All the plates were cut out by hand and it was quite an undertaking. Each transformer was put inside a wooden skeleton box having wire netting sides and bottom, and fastened to, or hung from, four insulators.

PLANT WORKED FINE.

The town plant worked delightfully only and always the engine tormented us. The plant was operated every night (the engine felt like it)—from April 6th to June 16th, when an attendant dropped a screw driver in the alternator and wrecked it.

During the two months' operation we had but one electrical trouble. On a wet night a leak from our 500 v. primaries set fire, to or rather smoked the side out of a shed—no damage was done. When the wreck of the alternator came, I tried to repair it, but could not do so satisfactorily. A great sense of rest and relief came over me when I realized that I was not obliged to start that engine again, for, while I publicly mourned with my townspeople, I secretly exulted and I had my revenge. I never gave that engine any further confidence or responsibility and finally sold it without a guarantee.

A SUCCESSFUL DESIGN.

Realizing that the Siemens' alternator was unfit for constant potential service, between December 5th and 15th, 1885, I designed and completed drawings of an alternator of my own—the radial pole type of a machine now so well known and sent them off to Pittsburg. It proved a really remarkable designing success. Calculated to deliver 500 volts at 100 RPM with 10 amps excitation, it actually gave 490 volts E. M. F. under those conditions, and, as it had a smooth armature core, large air gap and strong field, its inherent regulation was well nigh perfect. Further it was decently cool. Thus the last vestige of opposition from the doubting Thomas' was removed.

Perhaps you will forgive my egotism, when I say that this alternator was a great satisfaction to me. The only alternator manufactured at that time, so far as I know, was he Siemens' machine made in England and it was generally supposed that a successful alternator with an iron cored armature could not be made. Such was our ignorance. I took the position that a constant potential alternator should have an iron core, a strong field and weak armature magnetzation. This type of machine has finally displaced the Siemens', Mordey and other ironless machines. It has served and still serves a very useful purpose.

On April 16th H. H. Westinghouse and William Lee Church visited me and on April 16th George Westinghouse and a party of friends came to Barrington and saw the system for the first time. This visit determined Mr. Westinghouse to actively enter the alternating current field as the novelty and scope of the system surprised him greatly.

I have a very personal affection for a transformer. It is such a complete and simple solution for a difficult problem. It so puts to shame all mechanical attempts at regulation. It handles with such ease, certainty and economy vast loads of energy that are instantly given to or taken from it. It is so reliable, strong and certain. In this mingled steel and copper, extraordinary forces are so nicely balanced as to be almost unsuspected. This equilibrium is remarkable. It is like putting on the pan of a delicate chemist's balance, ten pound weights so exactly timed in their application, that never a tremor stirs the needle from its mark. In this rapid sketch I have only dealt with some of the incidents that directly bore on the Great Barrington work and have not attempted to trace the work of the engineers and investigators that followed its completion. This, therefore, is not a history of the art but an episode in it.

It is dreadful to be poor. I now feel convinced that if I had obtained the money necessary to pursue this work it would have been completed a year, or possible two years earlier.

I have been asked: "When did you first definitely decide upon the importance of the alternating system?" I do not know that I can exactly answer this question. I did not definitely prove its value until the summer of 1885, but the physical conception of the counter E. M. F. as a controlling regulating factor came in 1883. The real concept tion of value to me was the substitution of this E. M. F. for the resistance E. M. F. of Weston and the polarization

(Continued on [illegible] Page.)

(Over)

Mr. Stanley took 40 minutes to deliver his historical paper in which he interjected much "on Our First Alternating Current Plant and How It Started" comment of exceeding interest. He was closely followed by his audience. The address in part will be found on page 9.

In the grapery attentive listeners to the paper and tributes paid him were Mrs. William Stanley, their handsome and winsome daughter Miss Lila and Mrs. Walter F. Hawkins.

MR. SCOTT'S ADDRESS.

Charles F. Scott was the first speaker upon the general subject "Reminiscences." He graphically told of his acquaintance with the transformer made 24 years ago at the Hoosac Tunnel and of his visit to the Tunnel yesterday where he was drawn by an electric engine through an electrically equipped Tunnel all made possible by the transformer."

Dr. Charles P. Steinmetz stated that his status in the electrical world was very different from his friend Stanley's as Stanley belonged to the age of the heroes.

He paid a great tribute to him as a pioneer and to the other pioneers who did so much for electricity when they were forced to invent even the language in which to convey their discoveries. He told of his first sight of the transformer in this city in 1891 and impressed upon the engineers and students how much easier were their paths than the path of Stanley with like rewards for those who really discovered.

T. C. Martin bounded Berkshire in a new way: "On the south is Steve Field of Stockbridge on the north Frank Sprague while in the middle is William Stanley." He facetiously told of Stanley's promotion of incandescent lamps' with the hair of a Chinaman for the filament" and stated that of the 6000 power stations in the country 75 per cent were equipped with alternating motors and transformers. He suggested that the original transformer should be preserved as a priceless heirloom.

Dr. E. W. Rice gave many interesting reminiscences covering the period of his 30 years acquaintance with Mr. Stanley and paid a wonderful tribute to him not only as a man but as the ideal gentleman.

DR. THOMPSON'S TRIBUTE.

Dr. Elihu Thompson stated that to Stanley was due all credit "for the forefront application of the alternating current in the art and that it was particularly fitting to pay him tribute here in Pittsfield where are being constructed enormous transformers such as were never conceived in the imaginations of the original inventors." From his central station he has placed a heating current around our hearts which is full of live current." He is the great inventor who is getting from the world the best that is in it—is honest to the core—beloved by his fellows and has all the attributes of the perfect gentleman."

P. A. RUSSEL'S ADDRESS.

Parley A. Russell made one of the most enjoyable talks of the evening judging from the way it was received. It was full of reminiscences concerning the installation of the Great Barrington plant. "Stanley is a transformer. He not only built the first transformer but he has transformed barren wastes into beautiful gardens—old houses into architectural wonders and he transformed an empty house into a house resounding with the laughter of 9 heroes—a perfect 9."

He told of how the first plant carrying electricity for a distance of 8 miles was installed at his water plant in Great Barrington by Stanley years ago.

SPRAGUE APPOINTED BY DAWES.

Frank J. Sprague delivered the best talk of the evening in the snappy characteristic way of the inventor who has done things. He was Harriman's electrical man. He stated that he was honoring himself in coming to congratulate Stanley. "Whatever I am or have accomplished in the electrical field is due to Senator Henry L. Dawes, a Pittsfield man, who appointed me to the naval academy." He recited briefly a few of his own experiences in which he just missed inventing the transformer. Paying full tribute to Stanley's accomplishment he said "but more than money he has made from it—more than the honor which has come to him—is the heritage which he bequeaths to his family and posterity in having accomplished something for the good of the world."

Frederick Darlington gave personal reminiscences of his relations with Mr. Stanley and enlarged upon the thought of what the transformer had done for humanity.

W. S. Moody apologized for the absence of C. C. Chesney who, he stated, was unavoidably absent and told of his first meeting with Mr. Stanley whom as a student he met when Stanley was giving a lecture before the "Massachusetts Society of Arts." He then enlarged upon the inspiring personality of Stanley in making others work and credited him with having so interested him that he made transformer work his vocation.

Prof. Jackson then called upon Mr. Stanley who briefly but very feelingly responded to the tributes of his friends in which he presented the transformer to the American Institute.

Despite the fact that it was 12.45 an informal reception to Mr. Stanley followed.

To the committee in charge the local branch and the city are deeply indebted for an extraordinary affair.

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