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THE APPROACHING EXPIRATION OF THE BELL TELEPHONE PATENT.

The original patent for the electrical telephone was granted to Alexander Graham Bell, of Salem, Mass., on March 7, 1876, for the term of seventeen years. The patent expires March 7, 1893. On that day it will become free to the public, and thereafter all persons will be at liberty to set up shops, manufacture the instruments described in the patent, and make use of the invention. The following are the claims of the original Bell patent of March 7, 1876:

1. A system of telegraphy in which the receiver is set in vibration by the employment of undulatory currents of electricity, substantially as set forth.

2. The combination, substantially as set forth, of a permanent magnet or other body capable of inductive action with a closed circuit, so that the vibration of the one shall occasion electrical undulation in the other, or in itself, and this I claim, whether the permanent magnet be set in vibration in the neighborhood of the conducting wire forming the circuit, or whether the conducting wire be set in vibration in the neighborhood of the permanent magnet, or whether the conducting wire and the permanent magnet both simultaneously be set in vibration in each other's neighborhood.

3. The method of producing undulations in a continuous voltaic current by the vibration or motion of bodies capable of inductive action, or by the vibration or motion of the conducting wire itself, in the neighborhood of such bodies, as set forth.

4. The method of producing undulation in a continuous voltaic circuit by gradually increasing and diminishing the resistance of the circuit, or by gradually increasing and diminishing the power of the battery as set forth.

5. The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth.

If any one should be disposed to question the policy of granting patents for new inventions, some other example than the telephone probably would be needed in order to establish the contention. It is true that a number of alarming adjectives might be arrayed against the policy of patents, as illustrated by the grant of the Bell privilege. It might be alleged, for example, as a direct result of this policy that a huge monopoly has been created, which from a single center, like a gigantic octopus, has extended its slimy members into every part of the land and fastened itself, with relentless grasp, upon the throats of the people, robbing them of their means, compelling them to submit to exorbitant and unconscionable demands.

It is true this telephone octopus sucks in millions of money every year. In New York it installs instruments within your office or dwelling, runs wires for you underground, connects you with all business people and all the centers of business, waits night and day to answer instantly your calls, and then has the unblushing effrontery to demand payment at the rate of twelve and a half dollars a month, if you live in New York—something less if you reside elsewhere. In addition to the above, this horrible octopus, if you dwell in New York, connects you on call with Boston, Albany, Buffalo, Philadelphia, Baltimore, Washington, Pittsburg, and all the intermediate villages, towns, and cities, for which it extorts such extra sums as 25 cents, or 50 cents per long distance call. This ever-growing monster is constantly extending itself, and probably, before long, New York and Chicago will be telephonically connected.

From the last annual report of the Bell Telephone Company, it appears that the number of instruments in use at the close of the year 1891 was 512,407—a large increase over the previous year. The total earnings for the year were $4,375,290. The expenses were $1,505,872, leaving the net earnings at $2,869,418.

Admitting everything that can be said against the holders of the telephone patents, the injuries resulting from the monopoly are outweighed a millionfold by the benefits conferred by the invention upon the public. It is substantially the same in respect to other new patented industries. While it is true as a general proposition that private monopolies are apt to result injuriously to the public interests, and therefore are to be avoided, still the policy that encourages the production of new inventions by the grant of temporary monopolies called patents, is found by experience to be highly advantageous to the public weal.

It is upon this foundation our patent system chiefly rests. The inventor, lured by the promise of a patent, studies and labors to produce something new and useful, and if he succeeds, the law concedes to him the poor privilege of holding his invention for the period of seventeen years—a time so short it rarely suffices for more than a slight beginning toward the perfection and introduction of the invention. The public then come in and take full possession of the invention together with the results laboriously gathered by the patentee.

Poor as are the rewards of the inventor, and short the term of his patent, there are many people who complain; and in almost every Congress there is a corps of members who try to break down the patent system, by the passage of bills to shorten the term of patents or prohibit the pursuit of infringers, thus emasculating the patent law.

Bell seems to have had at the outset, when he took his telephone patent, only a very dim idea of its value and importance to the world. A student and teacher, unacquainted with business or the formation of trusts and companies, he parted with the patent for a comparatively small consideration. The purchasers have reaped some of the fruits of his genius; but the chief benefits will now accrue to the public. The patent is about to expire, and the telephone industry is only in its infancy. The owners of the patent have only introduced it to a trifling extent. They have built a few lines in the principal towns and cities. But when, by further experience, the art of telephoning becomes better understood, thousands of instruments will be used where now there is one.

The expiration of the telephone patent throws open to the public a new invention of incalculable value to the country. Its future development and expansion must necessarily give rise to many collateral new industries, furnishing wealth and employment for thousands of busy workers.

The Advantages of Bodily Exercises.

In the *Journal of the American Medical Association* for June 4 is an interesting paper by Dr. J. Madison Taylor on the "Influence of Bodily Exercises upon Length of Life." He commences by enunciating two propositions: (1) That judicious activities of the body tend to maintain and increase its efficiency; and (2) that the hurtful effects of violent athletic competitions are popularly overrated. The first of these propositions is obvious, and he therefore chiefly deals with the second. Against the growing interest in athletic matters there are constantly urged objections to the effect that many perfectly healthy young men are injured beyond repair by strains and shocks to vital organs received in the course of training or competitive sports, even among those who avow much confidence in the value of physical exercise; yet many declare the pity of it because such havoc is wrought thereby. Instances are cited, rather vaguely it is true, of fine fellows utterly wrecked by contests on land or water, of lives cut short by overtasks at so-called sports. After pointing how important it is for medical men to define and point out dangers and urgently insist on their avoidance in such cases, Dr. Taylor proceeds to argue that even the best and wisest of medical teachers can err in opinion, and cites as an example an assertion of Dr. B. W. Richardson:

"I venture to affirm there is not in England a trained professional athlete of the age of thirty-five who has been six years at his calling who is not disabled;" and the same author as saying: "When the artificial system of training ceases, the involuntary muscles, the heart especially, remain in strength out of all due proportion greater than the rest of the active moving parts of the organism."

Dr. Taylor maintains that this authoritative statement has swayed the judgment of thousands of thinking men. He has had these views on the damage done to involuntary muscles quoted to him again and again. Such cases he considers are indeed possible, and from such causes do they come in the laborious ranks of iron workers and those who put forth in long days excessive and continued muscular exertion. Among professional athletes the heaviest strains must come, as upon the output of the most concentrated force alone comes to them honest reward. Dr. Taylor has collected the brief histories of a score of these men now living which he thinks at least illustrate how vigorous and sound such men may be even long after the age limit which Dr. Richardson has assigned to them. These histories are interesting and some of them very remarkable, and Dr. Taylor is strongly of opinion not only that the judicious pursuit of bodily exercises, either in the line of ordinary avocations, special duties, or sports, tends greatly to maintain and enhance the vigor of both body and mind, but also that the hurtfulness of severe muscular exertion, short of profound exhaustion, is merely temporary and recoverable, and that dangers to internal organs and vital centers are comparatively rare.—*Lancet.*

Phenic Acid for Sugar Beet Preservation.

Those who have attempted beet sugar making in the United States, says the *Sugar Beet*, know the difficulty of keeping several thousand tons of beets without loss of sugar, caused by second growth or by fermentation during the period roots remain in silos. If silos are properly ventilated, the difficulty may in a measure be overcome; but during our very cold winters, communication with the exterior is impossible. Experiments upon a large scale show that 70,000 tons beets may be kept in a perfect condition for several months by the judicious use of phenic acid. Cost is less than one cent per ton of beets siloted. Two and a half gallons phenic acid in 250 gallons of water are sufficient for 1,000 tons beets.

Personal Recollections of Eminent Men.

BY DR. P. H. VANDER WEYDE.

I. General Krayenhoff, of Nymegen.

II. President Barnard, of Columbia College, N. Y.

It was my advantage to come in early life frequently in contact with eminent men, as my father was very exclusive about the people with whom he associated, and also because the city of Nymegen, by reason of its relics of antiquity and the romantic scenery of its immediate surroundings, had always great attractions for men of learning and of taste for the beautiful, who chose it either for a permanent residence or for a place of resort in summer more easy of access than any other of the kind.

My father had on the public square, called "the great market," and situated in the center of the city, a large house where he sold hats, furs, and broadcloth, and was renowned for the good qualities of his articles, so that only the best class of people came there, making the store, after the manner of certain villages in this country, often a kind of *rendezvous*, where from boyhood up I heard discussions about the newest discoveries in science, which subject had then become the favorite topic. I suppose it was because, during the preceding thirty years of tumult among the governments, people had become disgusted with politics and found a consolation and repose in science, as I have always found, and find more and more the further I advance in years. I have made that feeling my own which Whittier has so beautifully expressed in his poem entitled "My Triumph," in which he glories in the progress of his fellow-men.

One of my earliest recollections of such conversations was that one General Krayenhoff, one of my father's friends, dropped in to tell him and others present that at last a Danish professor of Copenhagen called Oersted had discovered the true relations between electricity and magnetism, which the Holland professor, Van Swinden, in Leyden, had been searching for in vain, and had described his experiments in three volumes without making that very one and simple experiment which revealed directly the true relation. All who are acquainted with the subject can easily imagine the discussion which followed.

This General Krayenhoff may be called exceptionally eminent. I met, in all my life, only one other man who was his equal in respect to learning. It was President Barnard, of Columbia College. Each of these men combined a full knowledge of the mathematical and physical sciences with a thorough study of the ancient classical literature, both could work out and explain the most intricate mathematical problem, and both could write an essay or oration in the most exquisite Latin. Krayenhoff earned, in 1786, the gold medal for a satisfactory answer to the question proposed by the French Royal Society, which was: "Has electricity, since its discovery, really contributed anything to the progress of physical science? and has its administration as a medical remedy been advantageous or hurtful to mankind?" He answered this in Latin, in a large quarto volume of 319 pages, illustrated with four large engraved plates; but the French preferred to have it translated into their language, which was done, and the work published in Amsterdam in 1786, of which he presented to me a copy with some other books (among them his own autobiography), at the occasion that I left my father's house to fill a professional calling in 1832, and which book I have before me. In later life, called for by circumstances, Krayenhoff applied his knowledge to the arts of war, while the other (Barnard) applied it during all his life to the arts of peace, chiefly to education. Both were very active workers. Krayenhoff made the triangulation of Holland, and topographical maps of details in regard to defense against foreign enemies, and the great interior enemy always threatening it, namely, inundation; he devised the means to keep the three great rivers, Rhine, Meuse, and Scheldt, which reach the ocean while passing through Holland, under perfect control, a thing which has yet to be done with our Mississippi, which, however, is a much more colossal work and will need the labor of more than one generation to study the details and devise proper means.

One of Professor Barnard's last labors was in the editorship of Johnson's Cyclopedia, which, with his learning and his knowledge of the proper men to take charge of the various topics, he made the best cyclopedia in existence, which earned very large profits for its publisher. President Barnard, while engaged at that work, requested me to write the article on the quadrature of the circle. I did so, and he was so pleased with the new and original aspect I gave to the celebrated problem that he inserted a biographical notice of myself in the appendix.

P. S.—I have no doubt that there have been other men equally versed both in science and literature, but I speak here only of my personal knowledge. Krayenhoff for some time filled the most exalted positions in the government of Holland, while Professor Barnard, who was satisfied with governing Columbia College, was considering the importance of training our future great men, not less exalted and influential than to be like Krayenhoff, Minister of War of Louis Napoleon as long as he was King of Holland, and later given the title of baron and the great cross of the Netherland lion, etc., whatever all this may amount to.

But Krayenhoff belonged to a generation passed away previous to President Barnard, whose generation is now also passing away; still it does not appear that Europe has yet advanced far enough to see the nothingness of empty titles, which the United States so wisely discard. Imagine only the idea that the president of any of our colleges was given the great cross of the American eagle, to be worn at the lower end of a sash, as is done with the Netherland lion. We leave such kind of ornamentations to the Knights of St. Patrick. C. S.

Ventilation of the Pennsylvania Tunnel, Baltimore.

The Pennsylvania is preparing to ventilate its tunnel through Baltimore by fans driven by electric motors, the current being transmitted from a power house situated near the North Avenue end of the Bolton yard. It is proposed to erect a ventilating stack and fan midway over the northern section. The work was commenced, says the *Railroad Gazette*, about two months ago, and is to be completed in October. The power house will be a brick structure 40 × 60 feet, with one end of timber covered with corrugated sheet iron, so that the building can be enlarged if necessary. The plant will include an engine, four boilers, generator and the necessary electrical apparatus. The currents for the operation of the fans will be conducted by wires, which can be run through the tunnel or above ground to the ventilating shafts. From this central power house it is also intended to light the tunnels by electricity. The ventilation will be accomplished by building a slanting subway 8 feet wide by 16 feet high from the side of the tunnel, near its top, to the foot of the ventilating stack, which, on account of the heavy foundation necessary, will be located at the side of the tunnel. At the foot of the shaft a large fan, fashioned like the blades of a steamboat propeller, will be revolved on a vertical shaft, forcing a strong upward draught. The vacuum created at the middle of the tunnel will cause the smoke and gas to be drawn from the end of the tunnel to its middle, and out the top of the stack. The stacks are to be 100 feet high and 18 feet square. Adjoining each stack a small ornamental brick house will be erected for the storage of oil and materials used in operating the system. Owing to the smoke and gas being thrown off at such a great height, and also by reason of the fan through the use of electricity being practically noiseless, the disagreeable features of using boilers and engines are reduced to a minimum. By this system it is expected that the tunnel will be cleared of smoke and gas in less than two minutes after the passage of a train. The Thomson-Houston Electric Light Company have the contract for the electrical work.

[FOR THE SCIENTIFIC AMERICAN.]

My 100,000 Sabers During our Civil War.

It may be of some interest to many readers to learn of the various processes which must be gone through in the production of an acceptable saber blade, to say nothing of the steel scabbard and brass hilts used for them, and of the troubles and triumphs of an arms manufacturer during our civil war.

Early in the commencement of our troubles I commenced the manufacture, at Trenton, New Jersey, of blades only for a firm in Philadelphia that made scabbards and hilts. At first almost anything was accepted, with little or no inspection; but as the government became supplied they became more and more particular. So I began experimenting on quality. I had a regular oak testing block made, which is on a circle of 35 inches circumference and a little less at the butt of the saber, or where its butt came. The United States required them to be struck twice over this oak block, so that the points would snap like a whip. If the blade remained bent so that it was perceptibly crooked either way it was condemned, and a small letter *c* stamped on the hilt or tang where it was fastened to the hilt by going through the hand piece and being riveted at the upper end.

They must be made of forged bars of the very best cast steel, and when finished be of certain lengths, widths, and weights to within one ounce either way, and be of a certain curvature, so as to enter and be withdrawn readily from the scabbard. We heated them in an oven to a bright cherry red, then plunged them endwise, point down, into an oil bath; and, in order to be sure of a good spring temper, they must come out so hard that no part of one could be scratched with the corner of a hard saw file, and then the temper drawn down over an open charcoal fire to a bright pigeon blue, and straightened with a copper mallet while the heat was in, and on the end of an oak block, and the proper curve bent in them edgewise in the same way. It was a big day's work for one man to harden, temper, and properly straighten one hundred in ten hours. We used the very best whale oil and kept up the carbon by using in it a quantity of resin and a little beeswax. We kept the oil bath cool by running water around a narrow tank—the water inside and out. I used salt water that I put into my oil bath occasionally with a sprinkling pot. The water would settle at the bottom, and I used a small pump to get it out.

This I found greatly assisted in getting them file-hard, as we called it, without cracking. For the first few months we lost fully half, that would not pass inspection. If they were slightly hard they broke, and that was the end of them; and if slightly soft they would stay bent, and that condemned them. So I kept trying some way of stiffening the softer ones. I found that by bluing them they were stiffened so that they would pass the test, but to polish off the bluing made them again soft. So now I must study up some way to take the bluing off without the polishing. I found that to put about a gallon of sulphuric acid in a half barrel of water, and plunge them into the acid water and rub them off quickly with a dry cloth, the bluing was removed but that the acid ate into the steel. So I arranged another tank of lime water to neutralize the acid. I then plunged the blue-hot saber into acid water, and from there into lime water, and rubbed it off quickly with a dry cloth and Viana lime dip, and I had a most beautiful polish. I fenced off a small room in one corner and carried my own key, and did this work for months and months. I at last persuaded my inspector, Mr. Massman, not to stamp *c* on the shanks, for I had found out a new way of retempering them. I finally got my work down so fine that I averaged ninety-nine out of one hundred pieces of steel that I started on. Another trouble I had was in getting just enough steel cut off to make a saber and no waste, as my hammered steel was very irregular in size. So I would stand a lot of bars on end and run them in a small dish of water until the steel displaced just so much, and then cut them off at the water mark. I got this so perfect that the pieces might vary considerably in length and yet did not vary a quarter of an ounce in weight. After nearly two years I ventured to invite my inspector into my private corner and explain to him my method. Said he, "Well, that cost you some study and ingenuity to get it up, and you are entitled to it. It is none of my business how they are made so that they pass inspection, and I believe you are now making the best saber that the government is getting."

I made thousands of fine officers' swords, some of which I received hundreds of dollars for. I made the swords for Com. Boggs, of New Jersey, who passed the rebel forts going into New Orleans, and the State paid me $800 for it. A prisoner in the New Jersey penitentiary did my finest etching and gilding. On one side of the blade for Com. Boggs' sword I had the entire resolution of the legislature etched, and on the opposite the naval battle scene of passing the rebel fort.

Finally, after over four years of the hardest labor of my life, the war closed, and all of my profits and over six thousand dollars of indebtedness, which I then owed, were in a lot of special machines, tools, and implements of no use except old iron. Still I was left with health and life, which was better than thousands of poor soldiers could say. I went to work and invented a method of inserting teeth in saws, formed a company and took considerable stock in the company for my patents; sold enough to pay all I owed, with a small competence left. My constant study brought on what was called softening of the brain. So I resigned, sold all of my interest in the company, and went to Europe for a rest and finally recovered. J. E. EMERSON.

A New Form of Gas Battery.

The remarkable way in which one branch of physical research leads to another is illustrated by the statement that has recently been made that Mr. Ludwig Mond has found a means of utilizing his discovery of the chemically active character of carbonic oxide by making nickel and cobalt separate this gas from the hydrogen with which it is mixed in the ordinary production of water gas. When the separated hydrogen is applied to strips of platinum, as in Grove's classical experiment, a powerful gas battery is constituted, which returns in the form of electricity, as is reported, 50 per cent of the total energy of the absorbed hydrogen. If the same gas were burnt under a boiler for raising steam, and the steam so made used in a first-class engine driving a good modern dynamo, the yield of electricity would not exceed 8 per cent of the fuel energy of the gas consumed, under the most favorable conditions. It thus appears that Mr. Mond has advanced another step in the way of economizing energy, not by improving the steam engine, but by going round it. Bearing in mind the admitted superiority, from the economical point of view, of the steam-driven dynamo to any form of galvanic battery yet devised, it would be a strange turning of the tables, says the *Journal of Gas Lighting*, if it were to be demonstrated, as a practical result of Mr. Mond's discovery, that the gas primary battery and the water gas producer together form a more economical apparatus for getting out the heat value of fuel into some useful form than any arrangement which has a combustion process for its starting point.