Two Thousand Electrical Inventions in One Year.

The Washington correspondent of the New York *Evening Post* reports the substance of a recent address by Mr. Edward M. Bentley, one of the examiners in the electricity division of the Patent Office. Speaking of the work of the electricity division and of the recent marvelous development of electrical inventions, Mr. Bentley said that about two thousand applications for patents in electricity were filed in 1882, of which about two-thirds were granted. To show how the subject had grown in importance within a very few years, he said that in 1877 electricity was a sub-class in a division. Now it is the largest division in the office and regarded as the most important.

This astonishing growth is due chiefly to two causes: first, the invention of the telephone; and second, the development of the magneto-electric machine. The telephone had opened, directly and indirectly, a wide field of invention. The minds of many persons throughout the country were turned to this class of inventions, and not only were improvements on the telephone itself attempted, but attention was given to a great many incidental appliances useful in its successful application.

The second great stimulus to invention was the development of the magneto-electric machine. For thirty years the world had been awaiting a cheap and convenient source of electricity. Immediately following the discoveries of Faraday and others, from 1830 to 1840, there was a widespread effort to make practical use of them, and special activity was manifested in the line of electric lighting. The arc light was put into practical form, and the foundations of incandescent lighting were laid. But no economic source of electricity was at hand, for the galvanic battery consumed too much zinc for profit. The principle of the magneto machine had, indeed, been long known, but it was left for an Italian, Pacinotti, in 1860, to perfect a machine wherein continuous and constant currents were generated. The idea literally lay on the shelf, however, until 1870, when Gramme reinvented practically the same machine, and pushed it into notice. He was speedily followed by the Siemens brothers, of Berlin, and by Mr. Brush and others in this country.

The magneto-machine, affording a cheap and abundant supply of electricity, immediately rendered practical all the half completed inventions of thirty years, and opened the way to many new ones. Brush got his patent in 1877, Weston soon after, and the growth of the electricity division has been steady and marvelous ever since. The inventions have been, however, rather in the application of known principles than in the discovery of new ones; for, during the fifty years that have elapsed since the investigations of Faraday, little new has been added to the science of electricity. The present activity springs from the application of well known exhibitions of the still unknown force. And, moreover, only a few of these features of the science have been as yet made of practical use.

One of the broadest and most successful patents appears to be the telephone. The man whose name is perhaps more widely known than any other in connection with inventions in this branch of invention is Edison. The "Wizard of Menlo Park" is an inventor rather than a scientist. His most famous achievements have been in the improvement in telegraphy and in the incandescent light. The versatility and fertility of his mind are amazing, and he enjoys the distinction of being the man who has taken out more patents than any one in this country and probably in the world.

Generally patents do not discover and cover new fields. By far the largest part consist of improvements affecting details. Thus, of the twelve hundred or more electricity patents issued in 1882 only a few possess a general interest. A singular feature in patents is the tendency to come in groups. At one time some particular subject, such as electric bells, seems to occupy the attention of inventors; then their minds will be turned in the direction of motors or lighting. Perhaps the leading tendency of late has been toward secondary batteries, or what is called the "storing" of electricity. It is well known that if the two terminals of a circuit, each of which is tipped with a small lead plate, are inserted in a vessel of acidulated water, so that the water will complete the circuit, a passing current of electricity will rapidly decompose the water into its two constituents, oxygen and hydrogen, the oxygen collecting at one terminal and the hydrogen at the other. If now they are allowed to unite again, the recombination gives out a current into a wire which is the reverse of that which effected their separation. Thus, as this form of battery can be charged at one time or place and discharged at another, it forms a most useful portable source of electricity. The popular conception of a secondary battery as a store box, in which electricity is bottled up like soda water and drawn off at will, is very erroneous. There is, to be sure, a "condenser," which actually stores up electricity; but a secondary battery, ready for use, contains no electricity whatever. It is simply an apparatus whose elements are in such a chemical condition that, upon their being placed in external electrical connection, a current will be generated therein.

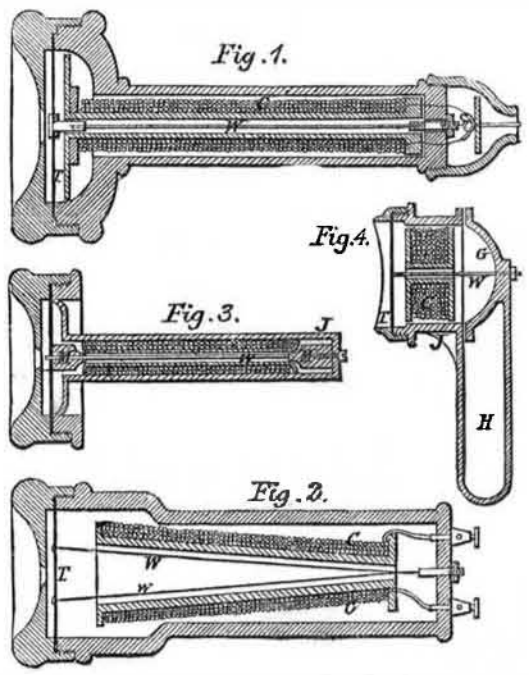
There can be no doubt that galvanic batteries, both in the simple and secondary form, are destined to play an important part in the application of electricity to common use. It is to the magneto-electric machine, however, that we look with most confidence. Electricity already is very serviceable to man. It sends our messages, calls the servant, gives an alarm of fire, announces the stealthy entrance of a burglar, regulates the temperature of a room, locks doors and windows, lights the gas, and does a hundred other services. In short, wherever it is wished to produce a mechanical movement at any distance, electro-magnetism is a ready, cheap, reliable, and tireless servant. On a large scale electricity as a motor is only useful in transferring power to convenient localities, as when a machine which generates a current is driven by a distant waterfall, but the translation of power into electricity and then its retranslation from electricity into power entail such losses that the electric motor must remain subordinate to steam, water, or other original force until a new and cheaper source of electricity is discovered.

THE REIS-THOMPSON TELEPHONE RECEIVER.

Professor Silvanus P. Thompson has lately devised, says *Engineering*, a new form of telephonic receiver of the type originally invented by Phillip Reis. In the Reis instrument the telephonic currents are received in a coil of wire surrounding a needle or rod of iron or steel mounted upon a suitable sounding box of wood. The variations of the strength of the current produce variations in the degree of magnetization of the needle, which, in consequence of the molecular changes thus set up, emits sounds. The final result of such molecular changes is, in general, to produce either an expansion or a contraction of the needle. If it be iron, steel, or cobalt, an increase of magnetization will cause it to expand in the direction of its magnetization, while if it be nickel, the contrary will take place.

In the well-known needle instrument of Reis, the sounds emitted are not loud, partly because the mass of magnetic metal is too great to permit the required changes in its degree of magnetization to be rapidly effected, and partly because the acoustic arrangement of the parts is defective and inconvenient. Professor Thompson's improved instruments are based upon the same principle of utilizing the expansion and contraction arising from the molecular changes set up by the varying degree of magnetization due to the telephonic currents, and the improvements relate to various methods of obviating or avoiding the defects of the Reis instrument, while preserving and developing its fundamental principle.

The figures annexed illustrate four of the forms that the instruments may take, similar parts being indicated by like



THE REIS-THOMPSON TELEPHONE.

letters of reference in each case. In the example shown in Fig. 1, a thin rod or piece of wire, W, of iron, steel, or cobalt, is fixed by one end to the center of a tympanum, T, of mica, horn, ebonite, sheet metal, or other suitable substance. Its other end is fixed to an adjusting screw or pin, S, by means of which the rod can be strained to any degree of tension. C is a coil of wire wound upon a tube of sufficient diameter not to interfere with the vibrations of the central rod. The combined tympanum, wire, and coil are inclosed in a case of convenient form, having an ear piece.

The general action of the instrument is as follows: If the current received in the coils, C, through the line from the transmitter increase in strength, it will change the molecular condition of the central rod, causing it to elongate slightly if of iron, steel, or cobalt, or to contract slightly if of nickel. A decrease in the strength of the currents will be followed by a partial demagnetization of the central rod, producing an inverse movement. Hence, as one end of the rod is tightly screwed up to the case of the instrument, the varying or fluctuating currents will cause corresponding vibrations of the tympanum. This telephonic receiver, when connected up with any suitable transmitter, reproduces sounds much more loudly than the original Reis needle instrument, and its articulation, especially of the sibilants and of some other consonants, is much clearer and more distinct than that of the common magneto-telephonic receivers.

In the form of instrument shown in Fig. 2 there are two wires, W and *w*, attached to the tympanum at different points, but terminating in a common adjusting screw, and surrounded by one coil. The wires may both be of iron or steel, but a better effect is obtained if one is of iron and the other of nickel, so that while one is expanding the other is contracting. Fig. 3 illustrates a modification wherein the ends of the central wire, W, are embedded in masses, M, of magnetic material, in order more effectually to produce its magnetization. One end of the wire is connected to the tympanum and the other to the closed end of an iron tube, J, which serves as the case of the instrument. In Fig. 4 the iron case, J, is shown wide and short, and provided with a bent handle, which carries an iron cup, G, to the center of which the wire, W, is screwed, the spring of the bent handle being serviceable to keep the wire in the proper condition of tension.

Status of the Telephone Patent Case.

The great interference case in relation to speaking telephones has not yet been decided by the United States Patent Office, although the arguments were closed on November 10, 1881, or more than one year ago. The interferences were preliminarily declared on March 26, 1878, the interfering applications and patents being those of Messrs. A. G. Bell, E. Berliner, A. E. Dolbear, Thomas A. Edison, Elisha Gray, A. G. Holcombe, James W. McDonough, and George B. Richmond. These interferences apparently involved at the outset eight different persons, two patents, and fifteen applications. Subsequently, Messrs. Berliner, Holcombe, and Richmond went out of the contest, either by default or their own concessions, and Mr. William L. Voelker was taken in. Recent developments in regard to transactions in telephone stock and other commercial movements in the telephone business give this great interference case an importance which at one time it did not have.

There are apparently six parties to the case—Messrs. Bell, Gray, Dolbear, McDonough, Edison, and Voelker. All had filed applications for patents upon inventions for transmitting speech by electricity, and to Bell patents had been issued. The interferences were declared by the Patent office, and the examiner was directed to determine to whom priority belonged. There are many complications in the case, and it is unnecessary to describe them now. A well informed electrician says that, in fact, there are only two parties to the case, and that these are McDonough and the interests controlled by the American Bell Company and the Western Union. Bell's application is, of course, in the interest of the Bell Company; Voelker, he says, is controlled by the Bell Company, through the Western Union, and by the Western Electric Company; Edison's interest is controlled by Bell, through the Western Union Company; Dolbear's interest is controlled by the Bell Company, and Gray's interest is controlled by the Bell Company, through the agreement with the Western Union. So the fight, according to this gentleman's statement, is McDonough against the field and against the Bell and Western Union combination. This combination was established after the suit for infringement brought by the Bell Company against Peter A. Dowd. In that suit testimony was taken, and then an agreement was reached that the Western Union should turn over to the use of the Bell Company all the telephone rights and patents in controversy; that the Bell Company should not interfere with the Western Union's telegraph business; and that the Western Union, or that part of it known as the American Speaking Telephone Company, should receive twenty per cent of the Bell Company's gross earnings.

It appears, therefore, that McDonough is the adversary of the established telephone interests in the great interference case. McDonough's interest is controlled by the United States Telephone Manufacturing Company, of New York, and it is said that this company, which has no plant as yet, has more than eighty valuable patents, some of them absolutely essential to the telephone business. In support of these patents the company has sued the Bell Company for infringement in New York and New Bedford, for using the telephone switch, and in Hartford for infringement in using what is alleged to be the McDonough receiver. These suits are pending. When the interference examination began in the Patent Office, the Voelker interest was, it is said, controlled by the Western Electric Company, but the controlling interest of the Western Electric Company has since been bought by the Bell Company. No one seems willing to predict the result of the interference case, although advocates of McDonough seem confident that this decision will favor him so far as the telephonic receiver is concerned. It is probable that whatever the result may be, an appeal will be taken to the full Board of Examiners, and perhaps afterward to the Commissioner of Patents.

The most formidable adversary of the Bell Company, so far as patents are concerned, is the United States Company, which controls the McDonough patents. The Bell Company's success in the Dolbear suit is not regarded as an important victory by some persons in Washington, and the suit at Harrisburg, based upon an injunction secured by the Bell Company, relates to the inventions of Drawbaugh, who is so far behind in the Patent Office that he is not included in the interference case. The McDonough company is, however, aggressive, and the decisions in its several suits against the Bell Company are awaited with considerable interest.—*The Operator.*

Melting Point of Fats.

Kratschmer conducts this experiment by bringing the substance to be tested into a capillary tube, placing a drop of mercury upon it, and then sealing the upper end of the tube. At the moment when the body melts, the drop of mercury sinks. The experiment can be repeated as often as desired with the same specimen.—*Zeitschrift fur Analyt. Chem.*