IN THE FIELD OF ELECTRICITY

THE Electrical Review, in a summary of the telephone situation and outlook for the present year, says: "Although the annual reports of the numerous telephone companies will not be submitted so as to furnish the exact statistics until well into the new year, yet it is well known that the increase in the total number of instruments has exceeded that of former years, and this phenomenal growth has outstripped the most sanguine estimates, and again postpones the anticipated saturation point of patronage, whose imminency conservative persons have anticipated from year to year. In addition to the growth of numbers, every use of the telephone appears to be increasing; it is trending upon the scope of messenger and mail, particularly in the conduct of commercial affairs where the prompt reply is an important supplement to the direct proposition."

When the Fuse Blows.

The "blowing" of a fuse in an electric street car, which fills the average passenger with alarm, simply indicates that a safety device has proved reliable and that a danger of injury to the motor has been averted by it. The current which will flow through a motor when it is standing still is in almost all cases far in excess of that which the motor is designed to carry; and, indeed, in a well designed motor a current dangerous for the motor will be reached before the motor has been stalled. The effect of this heavy current on the motor, if allowed to continue, is to heat the windings to a dangerous degree and destroy the insulation, possibly setting it on fire; and it is to prevent this occurrence, whether due to careless handling of the car or to unexpected causes, that the fuses are used. A fuse is simply a short piece of wire of such size that it will be melted by a current which, if allowed to flow through the motor for any time, will damage it. The melting of the fuse opens the circuit and cuts off the current from the motor. To protect the car the fuse is inclosed in a fireproof box.

When the fuse blows there is generally a volatilization of the metal of the fuse and a slight explosion. These explosions usually cause a report and some smoke.

Electrical Trade Gains.

Despite the reduced volume of trade in the electrical and closely allied industries which was evident in the last quarter of the year just closed, the total value of electrical and auxiliary manufactures in the United States in 1903, as shown by the western electrician's estimates, was greater than in 1902. The total for 1902 was $221,165,000, while the corresponding amount for last year stands at 234,750,000—an increase of about 5½ per cent. To be sure, the increase from 1901 to 1902 was nearly 15 per cent, but in view of the generally diffused opinion that the high-water mark of commercial properity has been reached and that the country has entered on an era of less pronounced activity, it will be a surprise to many to learn that in the electrical industries, at least, the country not only held its own in 1903, but even surpassed the record of 1902. It is evident that while there has been a decrease in the rate of growth, the falling off has been much less than many persons supposed.

Many branches show only comparatively slight variations from the 1902 figures. The largest single item is "dynamos and motors," given as $52,000,000, showing a healthy growth. However, if all classes of wires and cables be considered together, the total is over $60,000,000, being the largest item that enters into electrical construction. Here, too, a steady improvement has been shown. After wires and dynamos and motors, the third largest entry is opposite the telephone output, valued at $19,500,000. Some falling off is shown in this department, the estimate for 1902 being $21,000,000. Reciprocating steam engines for electrical plants show a slight decrease, but gas engines and steam turbines exhibit gains, more pronounced in the case of the latter. Undoubtedly "steam turbines" would be still larger if all the work in sight could be counted in the output of the year 1903.

For the first time "vapor lamps" appear in the list, the estimate being $30,000. Electric fans show a slight decrease, probably due to the cool weather of last summer. "Circuit-breakers" have taken a decided jump, but perhaps in this case the estimate of 1902 was too low. "Nernst lamps" and "space-telegraph apparatus" are comparative newcomers that show good gains.

Not included in the classification, but nevertheless of present-day interest, is the valuation of central-station heating plants, installed in connection with electric-light installations. One authority states that the value of this class of apparatus made in 1903 was $1,500,000, and this is undoubtedly a good estimate.

New Telegraph Marvel in Speed.

More details concerning a new marvel in telegraphy comes from South Orange, N. J., home of the inventor, Patrick B. Delany. The new method, it is claimed, will increase speed fortyfold and work a substantial decrease of telegraph tolls.

Mr. Delany's system is represented by three machines, the last and perhaps most remarkable feature of one of them having been added but a short time ago. The initial mechanism is one by which the messages are automatically composed for rapid transmission. There is next an automatic transmitter, by which the matter is sent over a single wire at a rate varying from 2,000 to 3,000 words a minute, according to physical conditions, and last an automatic receiving machine which records the messages.

In a small, plain, red-walled wooden laboratory in this borough, filled with electrical contrivances, with dynamos and all sorts of coils of wire and queer apparatus in odd corners, Mr. Delany was found absorbed in the work of putting upon paper the outlined image of the latest new thing that he had thought out. He is a stout man of about 55, with a strong head, thatched with gray, keen, spectacled eyes, and a ruddy face of the astute Celtic cast.

Delany began his life as a telegraph operator, and, like Edison, knew in his 20s the whole alphabet of the business, and was already dreaming inventions and their fruits. A sending instrument, called the synchronous, which was the fastest available for the use of Morse characters before he devised the broader system now under consideration, has been accounted one of his most important creations. The new system, which is designated by his name, has taken ten years to develop.

There has been delay in putting the Delany telegraph system in commercial operation, owing to the fact that the times have of late been unfavorable for new industrial enterprises. But it is proposed to create in the near future a company which shall build an entirely new set of lines, covering the entire country and doing a general telegraphic business. Experiments with the Delany system over a considerable distance along the Pennsylvania railroad, near Altoona, are said to have demonstrated that none of the claims made for it are extravagant.

Mr. Delany in speaking of his invention said:

"The operating speed with the Morse system reached its limitation several years ago, when fifty-two words a minute were transmitted by an operator for five minutes at a tournament trial. The average speed with a simplex Morse instrument, under favorable conditions of wire and weather, is fifteen words a minute, and with a duplex thirty words a minute. Sixty words a minute is the highest average of the quadruplex, and of late years that system has been in increasing difficulties, owing to the serious interference of trolley and power currents, which leak into the lines through the ground connections.

"Granted that the present maximum of speed over the wires under the old methods is sixty words a minute, the wire is capable of carrying over the average distance forty times that number of words. The telegraph companies, having years ago accepted sixty words a minute as the maximum speed, have multiplied their wires on this basis to keep up with the growing traffic. While under their system this multiplication must continue ad infinitum, and never actually keeps abreast of the necessities of the situation, the adoption of the Delany system would obviate a further increase of the number of wires for a half century to come at least."

The chief principles involved in the contrivance of Mr. Delany's transmitting machine, upon which really depended the solution of the problem of rapid telegraphy, are the use of both a positive and a negative current and the utilization of static electric energy, hitherto regarded as an antagonistic force in the mechanical application of electricity.

"The latest development of my system I have just brought to practical completion," said Mr. Delany. "It is an operating or composing machine, the working of which is controlled as is that of the typewriting machine. A keyboard of the universal typewriter pattern will be used. Anybody can learn to operate the machine as quickly as he or she could learn typewriting. This will eventually do away with the employment of the old Morse key, and it renders many desirable things possible.

"The business man would dictate his letters directly to the operator of the primary machine, who would be his ordinary typewriting secretary or stenographer. His correspondent would receive the transcribed message also at the hands of his ordinary typewriting secretary or stenographer.

"To the newspaper using much special telegraphic matter, and especially to those which lease special wires, as between New York and Washington, the saving in time and money by the Delany system will be enormous. Matter will be so rapidly transmitted that five newspapers will be able to use one wire, where now each of them must have its own wire. Thus they can divide the rental among them, amounting to about $30,000 a year per wire. Matter that does not require much editing could go from the receiving machine to the type composing machine in the newspaper office, where an operator, versed in the Morse characters, would set it directly from the tape.

"A new telegraph company will probably be organized in a short time to build and operate lines of its own, independent of all existing corporations."

Electric Signal System.

Travel in the New York rapid transit subway is to be made practically safe so far as collisions are concerned. The switch and signal system, which is to be installed early in May, will be a combination of several systems, each reinforcing the others and adding something toward the attainment of safety. Both electricity and compressed air will be used for power, and an innovation regarding the former will be the substitution of the alternating current for the direct current now in general use. Construction of the switches and signals will be such that the application of power will be required to give a clear track and permit trains to keep in motion. By the old system the block signal and the switch light or target naturally showed the safety position, and effort was required to produce the sign of danger. In the subway the danger sign will be the natural one. There will be 150 automatic block signals and train stops placed at intervals of 800 feet along the main lines of the subway. The system operates in such a way that when a car or train passes it the danger signal is displayed against succeeding cars and trains until the train passes the next block signal ahead by a margin in which a train may be stopped. Any failure of power or accident to the signal short of destroying it prevents the display of any except the danger signal. This, however, does not give safety. The motorman or engine driver may miss the danger signal or disobey it. The train stop then comes into play. It is a simple device, the stationary part of which is a T-shaped steel bar, operated by pneumatic power, and standing upright at the side of the track about a foot from the outside rail. The bar is attached to a shaft, which is connected with and moved by the mechanism of the block signal. While the danger signal is displayed from the block the "T" stands upright, but when the danger signal is withdrawn the "T" is bent down to a position horizontal with the rail. Each car is equipped with the other part of the train stop. It is a stout steel rod extending downward from the bottom of the car and at a point directly in line with the center of the "T." This rod is connected in such a way with levers controlling the motive power and air brakes that if it moved either backward or forward the power will be shut off from the motor and the compressed air released, applying the automatic brakes and stopping the train. The train stop has proved a success in Boston, and it is asserted that there has never been a collision where it was used. Its great cost, both of installation and maintenance, it is said, will prevent its general adoption by railroads. The interlocking switches of the subway will operate, wherever possible, in connection with the automatic signals and train stops. By their use every track or switch that is operated is barred against all other cars or trains. All the tracks of the subway will be embraced in the interlocking system, except those used for the storage of cars. When a switch is opened to admit a car or a train to the main line all other switches ing central locoations at two-thirds the leading into that main line block—that is, the spaces between the block signals on either side of the switch to be used—are automatically locked and cannot be opened until the block is clear. The opening of the switch displays the danger signal and sets the train stop "T" at the nearest block signal in the direction from which trains may be expected. In the yards away from main tracks, when switching is being done, no train but the one at work can get to the tracks and switches in use, as all switches leading to them are automatically closed and locked.

Single Phase Alternating Current.

Both in America and Europe much attention has been given of late to the possibilities of the "single phase" alternating current in operating electric railways. A line in northern Italy uses the three-phase current and the latter was employed in the now historic experiments on the Berlin-Zossen line. Of course, if one wire can be made to perform the function of three, line construction will be simplified greatly. Hitherto motors which were operated by a single phase alternating current have not given satisfaction, but various makers have now improved on the earlier designs. A trolley car run experimentally for several weeks this year on a road in Berlin is said to have demonstrated the feasibility of the one-phase system. Reports come from Italy of the recent trial there of another motor of the same type. A car was driven for a few hours at night until it had traveled 120 miles with encouraging results. There is reason to think, too, that leading manufacturers in the United States have also produced an excellent article of that class. The direct current motor may ere long cease to enjoy its present monopoly in traction work.