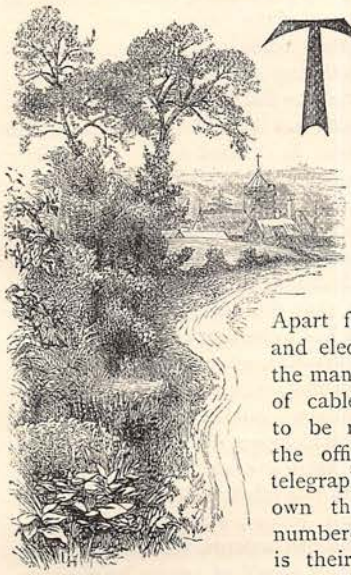
ON SUBMARINE TELEGRAPH SERVICE.



THE extraordinary development of submarine cables in every part of the world during the last twenty-five years has given rise to a special profession of considerable importance. Apart from the engineers and electricians required in the manufacture and laying of cables, which are only to be numbered by tens, the officials of the great telegraph companies who own the cables may be numbered by thousands. It is their duty to maintain the cables in working order, and to work the message-traffic through them. When we consider that there are upwards of 60,000 miles of cable in actual use, and that there are telegraph offices with *employés* stationed along the great lines of communication, at intervals of at least every 500 miles on an average, we can form some idea of the scope of the profession. Of course the management of overland telegraphs requires a vastly greater number of officials and operators —partly because land-lines require more attention than cables, and span very much shorter distances, but mainly owing to their intricate extension over the whole surface of populous countries. Of overland telegraph work, however, this paper does not propose to treat.

The principal *employés* of a telegraph company may be divided into two classes—the electrical staff and the manipulating staff. It is the duty of the former to keep the cable and the instruments in working order, and the duty of the latter to transmit the messages with as little delay as possible. The electrical staff of a company is usually composed of the electrician-in-chief, who remains at the head-quarters of the company, and receives reports from the district electricians as to the state of the lines. When some serious fault occurs on the lines, he may have to go abroad to see to it personally, but generally one or other of the district electricians is capable of setting all to rights without his aid. It is with the district electricians that we have more particularly to deal. Each station has its electrician—some have two. His duties are to test the cable regularly and report upon its condition ; to keep the instruments in proper working order ; and to localise or fix the position of any faults which may break out in the cable. Sometimes he may be required to proceed to sea in the company's repairing ship, and undertake the repairs. These consist in grapnelling the cable, pulling it up from the bottom, and extracting the fault. The captain of the repairing ship or some other of his officers is generally able to conduct the grapnelling and hauling in ; but the electrician must be able to find the position of the fault, and see the cable soundly repaired. Under him is the battery-man of the station, who attends to the batteries, cleaning them and supplying them with chemicals. He is the stoker of the electrical engine.

The manipulating staff consists of the general superintendent of the station ; under him are the clerks-in-charge and the operators. The clerk-in-charge is the overseer of the operators, and the right-hand man of the superintendent. There are generally two at a large station. The operators or clerks manipulate the instruments in transmitting and receiving the messages. Their work is thus a mere mechanical routine in itself, slightly spiced with interest at times by the character of the message. Some thought and management is required from the clerk-in-charge, and some business capacity, combined with scientific attainments, on the part of the superintendent. The electrician should have a thorough knowledge of the principles and practice of his special branch of science ; but he too often contents himself with efficiency in the mere routine duties of his station. It cannot be urged too strongly on a young electrician to keep always learning and acquiring a mastery of his profession, for at any moment he may be called upon to act in an emergency where his intelligence and skill may prove of great value to the company. Cable companies are beginning to learn by dear experience that a cable should not only be made of the best materials, but be in the best hands when laid. They are, therefore, now importing young men of higher general education and more technical training into their service than formerly; and the standard of the profession is gradually being raised. At present the clerks are not required to know anything beyond the mere manipulation, and they do not, as a rule, trouble themselves to know much more. But it should be borne in mind by a young clerk that the more he knows about the instruments he signals with, and the theory of the telegraph circuit, the more potentially valuable he is to the company. For occasions are constantly occurring when some slight defect in the working of his apparatus, causing a temporary delay in the traffic, could be remedied by him in a few moments, thus obviating the necessity of always sending for the electrician, who may be off duty at the time, and thereby saving the company from no inconsiderable loss.

A young man desirous of entering the submarine service should have a clear idea as to whether he wishes to be a member of the electrical or the manipulating staff. It is a common thing for intelligent and enterprising clerks to conceive a distaste for their routine work, and a liking for the electrician's duties,

as well as his salary, which is usually more than that of a clerk-in-charge. The electrician, too, is to a certain extent independent of the superintendent of a station. His proper superior is the electrician-in-chief of the company. But it is a very difficult thing for an *employé*, when once he is committed to the manipulating staff, to get transferred from it to the electrical staff, unless indeed he can bring effective influence to bear at head-quarters. In telegraph companies "friends at court" are, perhaps, too powerful. The few who have been exalted by their favour are not always capable men, and often not the most capable in the service. They are regarded with jealousy, and the system is fruitful of discord. The electricians of a company are so few in number, and the position so good, that they are generally selected by interest. The manipulating staff is, however, a much more open field.

An intending electrician should have a good general education as a basis, and if possible a fair knowledge of general physics, chemistry, and mechanics, including statics and dynamics, and the strength of materials. His chemistry will be serviceable to him in connection with batteries, and his mechanics in the construction of land-lines and the laying of cables. He should have a special knowledge of electricity and magnetism, their mutual relations, and their relations to general physics. He must, of course, be a fair mathematician, with a knowledge of geometry, including Euclid and a little conic sections, of algebra as far, at least, as quadratic equations, and of elementary plane trigonometry. He should have a thorough knowledge of Ohm's Law, on which all electrical measurements are founded—that is to say, the relations of the strength of the electric current to the electro-motive force, and the electric resistance in any given circuit. He ought also to be a fair mechanician, able to work the lathe, and to construct pieces of apparatus. Above all, we should recommend him to acquire a habit of study, which will not leave him even under the indolent influences of station-life in hot latitudes. With such a habit, he will be able to extend and deepen his professional knowledge, making himself not only efficient and skilful in taking the regular tests of the cable when it is in good order, but in applying the best known tests for localising faults when the cable "breaks down." He may even enliven the tedium of his station-life by making original observations and experiments on electrical phenomena, either general or peculiar to his locality, and may thereby be enabled to contribute results valuable to science.

A word of caution on the subject of some of the so-called "Schools of Telegraphy" may not be unnecessary. They claim to prepare young gentlemen for superior appointments in both departments of the submarine service in four or six months. Now, supposing that it were possible to turn out a "superior" electrician and manipulator in six months, there remains the important question where he is to get a situation. As we have already said, the *electrical* staff of a company is usually filled up through interest, and not by outsiders. The trained gentleman is therefore obliged to fall back on the manipulating staff. But in order to enter the service of a company he has to pass an entrance examination in manipulating the signalling key (in sending messages), and in reading the light-signals of the "mirror," or the written signals of the "siphon recorder" (in receiving messages). The manipulating may be very satisfactory; but he is almost certain to fail in the trials at reading, because the signals he has learned from are found to be different from those he is tried with. The mirror signals, especially, change their character; they are quick or sluggish, sharp or round, according to the cable they are received through, and they are never the same on an "artificial cable," such as are commonly employed in the schools, as they are on a real cable. The consequence is that the clerk either fails in his pass examination, or has to be sent to one of the company's own training stations, where he can practise on a real cable. But for this he either receives no salary or has to pay a premium. Such a training station is the Eastern Telegraph Company's station at Porthcurnow, Cornwall. In such a case the expense of the preliminary school-training might well have been saved. A thoroughly efficient school, with proper artificial cables, instructors and instruments, well patronised by the telegraph companies, would of course be a desideratum; but, as far as we can learn, those which do exist are not yet on that footing, whatever they may become. An intending electrician or manipulator should proceed with caution in respect of these schools. The electrician should first make sure of getting an appointment before he trains himself; and the clerk should see whether it would not be better for him to avoid the school, and enter the training course of the company at once.

After undergoing the preliminary examination successfully, a clerk is admitted into the service of the company. He is sent abroad, first to some station where he can gain more skill. His salary will be about £100 per annum, but he will have free quarters. As he improves, and is sent further abroad, his salary rises to £150, or, if he attains to the higher grades of clerkship, £200 per annum. If he is intelligent and industrious he will become a clerk-in-charge in time, at a salary of, say, £250; and if he is fortunate enough to become a superintendent with charge of a station, he will have a salary of from £300 to £500 per annum. A young electrician enters upon his station duties at a salary of about £200 a year. If he rises to be chief electrician of a principal station, he will have as much as £400 a year. His next and highest step is that of electrician-in-chief to the company.

The principal submarine companies and their lines are the Eastern, whose system extends in duplicate lines from England by the Mediterranean to Bombay, and which is, perhaps, the most enterprising of them all; the Anglo-American and Direct United States Companies, possessing the Atlantic cables; the Brazilian Submarine, connecting England to Pernambuco in Brazil; and the Western and Brazilian, working coast-cables from Pará on the Amazon to Monte Video;

the West India and Panama, possessing most of the West Indian lines from Demerara to Florida; the Great Northern, a Danish company connecting China and Japan through Russia to England; and the Eastern Extension, carrying the lines of the Eastern Company from India to Australia and New Zealand by way of the East India Islands. Some of these companies, such as the West India and Panama, have no regular electricians at their stations, but employ a travelling electrician. There are usually about a dozen *employés* at each important station, including superintendent, clerks-in-charge, electricians, clerks, and battery-man. The stations are fixed at towns or settlements whose traffic is valuable to the company, or where a convenient break in the line of cables occurs for "translation" or "re-transmission" of messages. For instance, the Eastern Company has stations at Porthcurnow, Vigo, Lisbon, Gibraltar, Marseilles, Malta, Alexandria, Suez, and Aden, on the direct route to Bombay, and there are re-transmissions of a Bombay to London message at all these places. It is worthy of remark in passing, that even with so many re-transmissions, an ordinary message traverses the whole system in eighteen minutes; and with special arrangements beforehand, the result of the Oxford and Cambridge boat-race is known in Bombay within two minutes after the event.

A telegraph station usually comprises the superintendent's office, the instrument-room, where the sending and receiving of messages are carried on, the testing-room of the electrician, and the battery-room. Adjoining these offices are the clerks' quarters, consisting usually of bed-rooms, mess-room, and reading-room, where are to be seen the home papers subscribed for by themselves. Sometimes at large stations a billiard-room is added. In certain parts of the world, such as the West Indies, Brazil, and the colonies, the clerk can cultivate very good society if he chooses. He may even enter the best the country can afford. But, in general, he does not avail himself of these advantages. Telegraph clerks are, as a rule, rather deficient in all kinds of culture except the "dot, dash" of their calling. They therefore keep to themselves and their quarters, or seek their pleasure in the streets, or at the public places of amusement which are to be had. In certain outlandish places, such as the Island of St. Vincent, off the coast of Morocco, or St. Pierre, off the coast of Nova Scotia, they are thrown entirely on their own resources, and must create their own amusements. St. Vincent is a bare heap of volcanic ash basking under a tropical sun, without a blade of natural verdure to refresh the eye, and no connection with civilisation except the occasional visit of the mail-steamers for a few hours. St. Pierre is a bleak Atlantic rock tenanted by a few French-Canadian fisher-folk. But yet these two places are not entirely destitute of some means of recreation. They both offer good boating and fishing. Aden, than which there is perhaps no hotter place on the globe, offers good flamingo and wild-fowl shooting. There is something to fall back upon at every station, except perhaps at Suez, where, as far as I know, the clerks have nothing better to do to pass the time than to look at the desert sand which stretches all around them, and wish for a good shower of rain.

With all this idleness there is a great deal of gossip, scandal, and discontent prevalent at telegraph stations, which tells harmfully on a young man. Cut off from the ties of kith and kin, from lectures, libraries, and even from church, he is only too apt to forsake good principles, and perhaps to adopt those that are reprehensible. Another disadvantage of the life is its unsettled character. A telegraph clerk must hold himself in readiness to be sent to any part of the company's system, on the shortest notice, whenever he may be wanted. As a clerk he is rarely in a position to marry, partly owing to the migratory nature of his employment, and partly to the low salary. As a superintendent he can, of course, "settle down," and sometimes, although rarely, even as a clerk-in-charge. But the superintendentships are few and far between; and although it is true, as an eminent authority has said, "that there are two classes of clerks—those who are mere machines, and another whose intelligence, business aptitude, and earnestness of purpose will lead them to the highest grade of the profession," still it must not be forgot that personal interest is unusually powerful in telegraph companies, where the powers that be reside at home, and individual merit is exhibited abroad, whence it never comes to their knowledge except by the indirect way of a report from a third party.

In making these remarks, we have wished to give some insight into the real character of the telegraph service abroad, the facilities in getting appointments, and the prospects of a career in it. The work of an operator at a cable station is mere mechanical routine. That of an electrician can, on the contrary, be made very interesting. Fewer men are really in constant demand by the companies than is generally believed, and few of the companies are in a flourishing condition. Nearly all the electricians required, and many of the clerks, are drawn from private sources. The career to talent is not so open as it ought to be, but to those who have their heart in their work, steadiness, industry, tact, and intelligence, a superintendentship is likely in the end to come. For those, however, who have no superior energy, originality, or finer susceptibilities, the life of an operator is best suited. Any youth in search of an easy, motiveless existence, will find it in the submarine telegraph service.

J. MUNRO, C.E.