Inhaling the vapour of a piece of camphor inclosed in a small silver tube, and carried in the mouth like a cigar, has also, I know, been used with effect. I have judged that the attacks are, to a certain extent, connected with a depressed or relaxed state of the system, partly from the time (early morning) when I have found them at their worst, and partly from the fact that in a pure bracing air like Switzerland I do not get them, even in the haying season. A French lady with whom I once travelled by train tried to satisfy me I had only influenza (*la grippe*), but our passage through a hay-field soon brought on such a succession of sneezings, &c., that I was quickly accorded the honour of a distinct disease.

I tried the homœopathic remedy of extract of hay grasses in spirit, upon the advice of a friend, but I very soon came back again to my allopathic doses of quinine and camphorated spirit, and from these alone have I found any real benefit. I have not yet tried the solution of quinine applied to the nostrils.

Guildford, May 18 J. RAND CAPRON

THE STEAMSHIP "FARADAY" AND HER APPLIANCES FOR CABLE-LAYING*

THE lecturer in his introductory remarks observed that an electric telegraph consisted essentially of three parts, viz., the electro-motor or battery, the conductor, and the receiving instrument. He demonstrated experimentally that the conductor need not necessarily be metallic, but that water or rarefied air might be used as such within moderate limits; at the same time, for long submarine lines, insulated conductors strengthened by an outer sheathing were necessary to insure perfect transmission and immunity from accident. The first attempts at insulation, which consisted in the use of pitch and resinous matters, failed completely, and in the years 1846 and 1847 the two gums india-rubber and gutta-percha were introduced, the former by Prof. Jacobi of St. Petersburg, and the latter by Dr. Werner Siemens of Berlin; this last gum soon became almost indispensable to the cable manufacturer on account of its great plasticity and ductility.

The first outer sheathing used was a tube of lead drawn tightly over the insulated wire, and this again was covered with pieces of wrought-iron tubing connected by ball and socket joints; in this way the Messrs. Siemens successfully crossed various rivers. This method was superseded later on by the spiral-wire sheathing, first proposed by Mr. Bret in 1851 for the Dover and Calais cable; since then, with few modifications and exceptions, this form has been universally adopted.

The lecturer next enumerated the casualties to which submarine cables are liable, and the precautions employed to obviate them. He showed specimens destroyed by rust and the ravages of a species of Teredo. On the Indo-European line a curious case of fracture occurred; a whale, becoming entangled in a portion of cable overhanging a ledge of rock, broke it, and in striving to get free had so wound one end round its flukes that escape became hopeless, and so had fallen an easy prey to sharks, which had half devoured it when the grappling iron brought his remains to the surface. Other enemies to be dreaded are landslips, ships' anchors, and abrading currents.

The new Atlantic cable consists, for the deep-sea portion, of copper conductors, gutta-percha insulators, and a sheathing of steel wires covered with hemp; the shallow-water part consists of similar conductors and insulators sheathed with hemp, which in turn is covered with iron wire.

In paying out, the great point to be observed is that no catenary should be formed, but that the cable should be a straight line from the ship to the sea-bottom; the retaining force should be equal to the weight of a piece of cable hanging vertically downwards to the bottom of the sea. In picking up, a catenary is formed, but a vertical position is the best.

From the peculiar nature of the service for which a telegraph-ship is required, it is evident that she must possess properties somewhat different from those of ordinary ocean-going steamers; thus speed is not so important as great manœuvring powers, which will enable her to turn easily in a small space, or by which she may be maintained in a given position for a considerable time. In the ship about to be described an attempt has been made to meet these requirements.

The *Faraday*, of 5,000 tons register, was built at Newcastle by the eminent firm of Messrs. Mitchell & Co.; she is 360 ft. long, 52 ft. beam, and 36 ft. depth of hold; there are three large water-tight cable tanks having a capacity of 110,000 cubic ft., these are each 27 ft. deep, two are 45 ft. in diameter, and one is 37 ft., they can take in 1,700 miles of cable $1\frac{1}{4}$ in. in diameter. After the cable is coiled in, the tanks are filled up with water to keep it cool, for the lecturer had found, when conducting experiments on the Malta and Alexandria cable with his electrical resistance thermometer, that heat was spontaneously generated in the cable itself, whereby its insulation was seriously endangered.

The *Faraday* has stem and stern alike, and is fitted with a rudder at each end; both are worked by steam-steering apparatus placed amidships, and are capable of being rigidly fixed when required. She is propelled by a pair of cast steel screws 12 ft. in diameter, driven by a pair of compound engines constructed with a view to great economy of fuel. The two screws converge somewhat, and the effect of this arrangement is to enable the vessel to turn in her own length when the engines are worked in opposite directions. On the voyage from Newcastle to London a cask was thrown overboard, and from this as a centre the ship turned in her own length in 8 minutes 20 seconds, touching the cask three times during the operation. This manœuvring power is of great importance in such a case as repairing a fault in the cable, as it enables the engineer to keep her head in position, and, in short, to place her just where necessary in defiance of side-winds or currents.

The testing-room of the electrician in charge is amidships, and so placed as to command the two larger tanks, while the ship's speed can be at all times noted on the index of a Berthou hydrostatic log.

The deck is fitted with machinery to be used in laying operations, which will be best described by tracing the path of the cable from the tanks to the sea. Let us begin with the bow compartment: the cable, which lies coiled round one of Newall's cones, begins to be unwound, passes up through an eye carried on a beam placed across the hatch, next over a large pulley fitted with guides, and by a second pulley is gently made to follow a straight wooden trough fitted with friction rollers, which carries it aft to near the funnels; here it passes through the "jockey," which is a device for regulating the strain, consisting of a wheel riding on the cable, which can be adjusted by a lever, and a drum fitted with a brake, thence it passes on to a "compound paying-out and picking-up machine;" this consists of a large drum provided with a friction brake, and round it the cable passes three times; it is also furnished with a steam-engine, which by means of a clutch can be geared on to the drum when required. Now in paying out, the cable causes the drum to revolve as it runs over it, and the brakes regulate the speed as the vessel moves onward; but should a fault or other accident render it necessary to recover a portion, the drum is stopped and geared on to the engine, the ship's engines are reversed, the stern-rudder fixed; and so what was formerly the bow is now the stern, while the little engine hauls in the

* Abstract of a lecture delivered at the Royal Institution on May 15.—By C. William Siemens, D.C.L., F.R.S.

cable over the same drum which before was used to pay it out; thus it is coiled back into the same tank whence it started. By this means the necessity of passing the cable astern before proceeding to haul it in is avoided. It was during this operation that an accident befell the Atlantic cable in 1865, causing its loss for the time.

The next apparatus is a dynamometer, consisting of three pulleys, one fixed, and the centre one, which rests on the cable, movable in a vertical plane; by this the strain is registered and adjusted. After passing this the cable runs into the sea over a pulley carried on girders and constructed so as to swing freely on an axis parallel to the length of the ship, so that, should the vessel make lee-way, the pulley will follow the direction of the cable, and thus friction and sharp bends are avoided. The bows are also fitted with a similar pulley, compound machine, and dynamometer. We see that by these devices the cable is kept perfectly under control, and should a fault be discovered a simple process of reversal of ship and machinery brings home the faulty portion.

Another great point is to keep the vessel trimmed and steady. For the former requirement nine separate water-tight compartments, including the cone in each tank, which also is hollow, are provided, so that water may be admitted as the tanks are emptied of cable, and thus the ship is kept trimmed. To ensure steadiness and avoid the rolling to which telegraph ships are subject, two bilge keels are set on at an angle of 45°; this was done at the suggestion of Mr. Wm. Froude, whom, said the lecturer, "I have to thank for valuable advice and assistance on several new points connected with the *Faraday*."

A steam-launch is carried on deck, whence she can be lowered into the water with steam up, ready to land shore ends and perform other useful details.

Another class of work for which the vessel is fitted is "grappling" for lost or faulty cable. In shallow seas this is a very simple operation, but in deep water it is rather a delicate matter, and requires the co-operation of two or even three vessels, so as to lift the cable without forming an acute angle, and thus to lessen the chance of fracture or strain. A special rope made of steel wire and hemp, and of great strength, is provided for this kind of work. Some specimens shown could bear strains up to 16 tons.

In conclusion, the lecturer paid a high compliment to the late Prof. Faraday, noticing the great services he had rendered to electrical science, his singleness of purpose, and the invariable kindness with which he had encouraged younger labourers in the same field. The friendly encouragement which he himself had experienced from him would ever remain a most pleasing remembrance. He had seized with delight on the present opportunity to pay a tribute to the honoured name of Faraday, and was happy to be able to do this with the full consent of the revered lady who had stood by the philosopher's side for forty years, while labouring under this very roof for the advancement of knowledge. The name of the vessel and her mission in the service of Science would combine, he thought, to create an interest in her favour in the minds of the members of the Royal Institution, and he hoped that on the morrow she would put to sea accompanied by the earnest wish, "God speed the *Faraday*."

ATMOSPHERIC CURRENTS AS OBSERVED IN THE WEST INDIES, AND PARTICULARLY IN ST. THOMAS

DURING an average period of nine months in the year the regularity of the air-currents over the Virgin group resembles clockwork. The surface, or lowest current, is formed by the trade-wind, which blows briskly from the north-north-east, with a slight variation northward during the night and early morning, and a corresponding deflection southward from noon till near sunset. Varying in strength from a light breeze to a brisk gale, it is hardly ever absent; its greatest strength is usually at or near 3-4 A.M., and about the same hours P.M. It generally bears with it light masses of cumulus, from which there fall occasionally showers, heavy, but very short in duration. This air-current, known as the trade-wind of these regions, does not appear to exceed 2,000 feet in vertical height.

Next above this current comes the south-west wind, rarely absent; it brings with it light cirrus clouds, but seldom cumulus or other indications of rain; its excess of moisture having been probably discharged while crossing the mountains of the South American continent. Very rarely, indeed, does this wind descend low enough to have effect on or even near the surface; when it does so, which generally occurs during the summer and autumn months, it is deflected to the south, and then becomes loaded with moisture, and accompanied by heavy nimbus clouds and electric phenomena.

Highest of all the west wind reigns, manifested by very light cirrus clouds, rapidly formed and as rapidly disappearing; it has at times a slight deflection to the north.

These three winds blow with scarcely any interruption from November to June inclusive; almost the only variation being then afforded by the north or north-north-east wind which sometimes prevails, but near the surface only, for a few days together during three winter months. When —a rare but much-desired event—a southerly current occurs about this time, it brings heavy clouds and abundant rain. While the wind is from the north and north-east, great dryness is indicated by the hygrometer.

But in the months of August, September, and October, and often in the latter half of July, the polar or north-east current loses its strength, and is often neutralised or even conquered by the southerly winds. These during the summer are usually light, and accompanied by a clear and serene sky, only clouded when the north-east, regaining for a time its supremacy, drives the south back, and precipitates heavy showers, amid thunder and lightning, sometimes lasting for three or even four hours; after which the wind veers round again to the south-east and south. The same phenomena, when intensified, concentrate themselves into a hurricane or cyclone—a rare occurrence in this island, not more than four of any great severity having taken place at St. Thomas in the course of the present century. Two indeed, but only of medium violence, occurred within these regions last year; neither of them however visited St. Thomas, the one keeping out to sea eastward, and not touching the coast till it reached lat. 44° in its northerly course; the other, which seems to have originated within the Caribbean Sea, did considerable damage on the coasts of St. Domingo and Cuba, passing ultimately north-east by the Florida Channel. Of both I have given details elsewhere (vol. ix. p. 468). Heavy gales, occasionally amounting to storms, sometimes blow here, particularly during the winter months, from between north and north-east, but from no other quarter of the compass. They are accompanied by cold, the thermometer sinking to 74° F., or even lower, with a dull, cloudy sky, and little rain.

Another phenomenon, peculiar to the winter and spring months, are white squalls; they take place on calm days, generally at noon, and most often at no great distance from shore; their area is very limited, and their duration does not exceed a few minutes; in some respects they resemble a miniature hurricane, and appear to be due to similar causes; but neither have I witnessed in them nor heard recorded any instance of circular motion. They are much dreaded by the small craft of these seas; a slight fall of the barometer is their only premonitory indication.

St. Thomas W. G. PALGRAVE