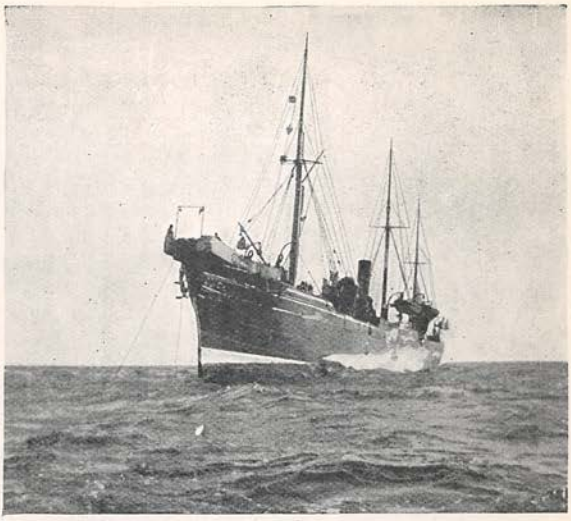
ON BOARD A CABLE HOSPITAL.

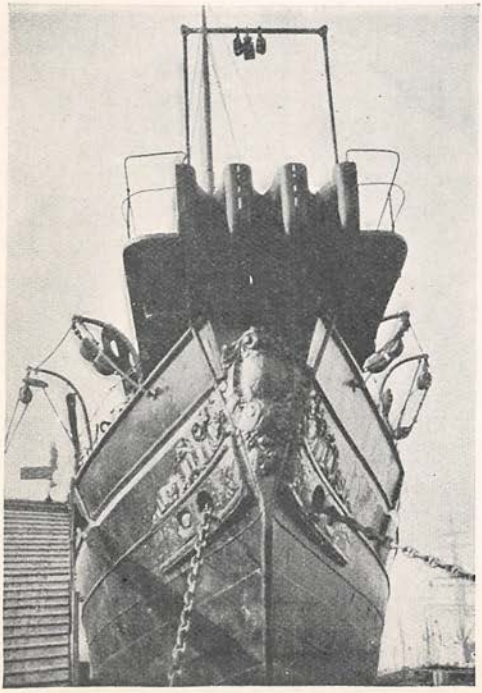
By A. Wallis Myers.

Photographs by R. A. Shield.



S.S. "MINIA": THE CABLE BEING "PAID OUT."

WE hail a passing hansom in Ludgate Circus and in twenty jolting minutes find ourselves in a dingy riverside train *en route* for Millwall Docks. An army of chimneys, reeking with vile smoke, an "alight" on to an oath-hardened platform, an uncomfortable passage down a narrow, ill-lit subway, and we are nearing one of the main East End docks, which contain such a strange flotilla of craft, home for stores or repairs. But our eyes are directed to a fine steamship, 325ft. long and 35ft. broad, a tonnage of 1,850; it is the *Minia*, the cable-repairing ship belonging to the Anglo-American Telegraph Company.



THE BOW, WHERE THE CABLE IS PULLED IN.

We are there to inspect the vessel and to ask questions; and for this purpose we hold a letter of introduction to Chief-Officer Adams, a gentleman who is well qualified to speak scientifically on the delicate and absorbing subject of cable-laying, and who forms one of a group of a dozen capable officers who control the fishing and mending operations on board.

It may, perhaps, be advisable briefly to sketch at this point the history of the Atlantic Cable, in the almost daily "doctoring" of which the *Minia* is employed. More than forty years ago the Atlantic Telegraph Company, soon to be converted into the Anglo-American, endeavoured to lay the first deep-sea cable, a praiseworthy attempt which, though not successfully carried through — the cable broke in mid-ocean—was highly commended by scientific men, and the subject of considerable excitement in the eyes of the public. That was in 1857. A year later another effort was made, and eventually a cable was laid between Ireland and Newfoundland; but its condition was such that it lived only a few days, and the cost of both expeditions was lost. Notwithstanding these failures, and the crude manner in which the scheme was carried out, the projectors did not lose heart, nor were they dismayed by the fact that public faith in deep-sea telegraphy weakened—indeed, no further funds were forthcoming till 1865. Then another fruitless journey over the Atlantic was made. In '66, however, the Anglo-

American Company recovered the lost cable laid the previous year, and not only completed it, but laid a duplicate to Newfoundland. This was the beginning of the great series of cable links which now connect John Bull with Cousin Jonathan. The practicability of laying deep-sea cables having been demonstrated, and the possibilities of steam navigation having greatly developed, a wire was "paid out" by the ton, and we now have eleven Atlantic cables hourly working between the two countries. The Anglo-American owns four; the Commercial Cable Company, four; the American Company, two; and the Direct United States Company possesses a single cable, laid in 1874.

It is not necessary to dilate upon the many interesting and astonishing records in telegraphy under the ocean which have been accomplished. Suffice it to state that in the limited time which is at the disposal of the London Stock Exchange to send messages to its financial contemporaries in Wall Street, New York, as many as 2,000 messages have frequently been transmitted between the two Exchanges, which means that about ten seconds is apportioned for each message over a distance of 4,000 miles.

And perhaps more wonderful — a triumph not merely of scientific discovery, but of human skill —was the feat of cabling performed at the annual chess match between the British House of Commons and the American House of Representatives in Washington, for "moves" were actually exchanged in the space of thirteen seconds!

A SIGN-BUOY GOING OVER.

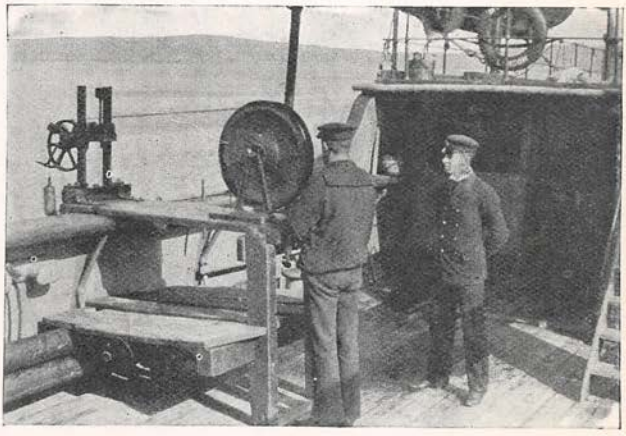
Our first call on board the *Minia* was the chart-room, where repose priceless maps and diagrams tracing in minute details practically every inch of the cable, as it has been originally laid. It was explained that the cables start from Valentia, in Ireland (whence short communications are fixed to London, Glasgow also being in direct telegraphic line), and go westward to Newfoundland, and thence to New York, which is in telegraphic communication with the whole of the North-American Continent, including San Francisco.

TOUCHING THE WATER.

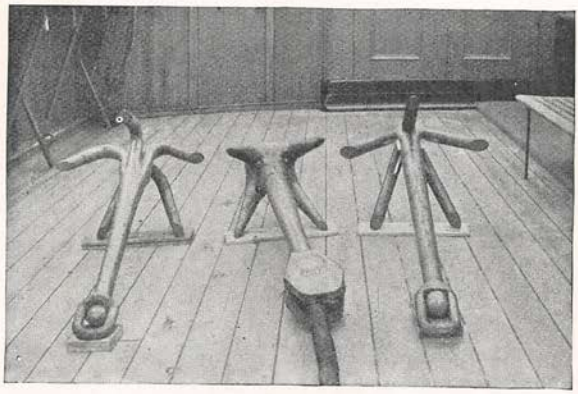
"You will notice," said Mr. Adams, as we began to make a tour of the vast array of mechanical and scientific apparatus on board, "that it is absolutely essential for our work to have a fast vessel, one so manned and carefully planned that she can scuttle off to the scene of a breakdown at a moment's notice. Time means money, and the 'fault' may be a thousand miles from where we are stationed. Again, the ship must be possessed of first-class manœuvring qualities; she must be able to turn in her own length and able to lay in close to the shore if the nature of the operation in hand demands it. Thus it is that we have here a ship perfectly sound and faultlessly equipped from top to bottom."

The *Minia*, it seems, is capable of paying out 500 miles of new cable and repairing

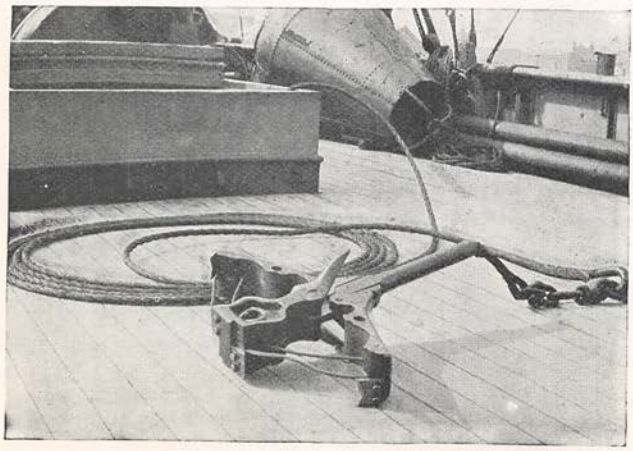
one in any depth up to two miles, unaided by other vessels. There are three cylindrical water-tight tanks, into which the new cable is very carefully wound yard by yard from the outside, a truncated cone being fixed in the centre. Different coils are prevented from adhering to each other by a coating of whitewash, the end of each nautical mile being carefully marked for future reference. As will be seen from our illustration on the next page, the cable is coiled in huge tanks, in remarkable uniformity, a feat which is accomplished entirely by the sailors themselves, in the same manner precisely as a coil of rope is wound round. Indeed, the dexterity and accuracy with which the work is accomplished may be gauged by the fact that each of the tanks, 30 feet in diameter and 15 feet deep, will hold 200 miles of cable. Needless to say, every foot of cable is thoroughly tested at the factory before it comes on board, and previous to embarkation is sheathed and stored in large water-tanks, which are kept at a nearly uniform temperature by means of water.



SOUNDING ON BOARD.

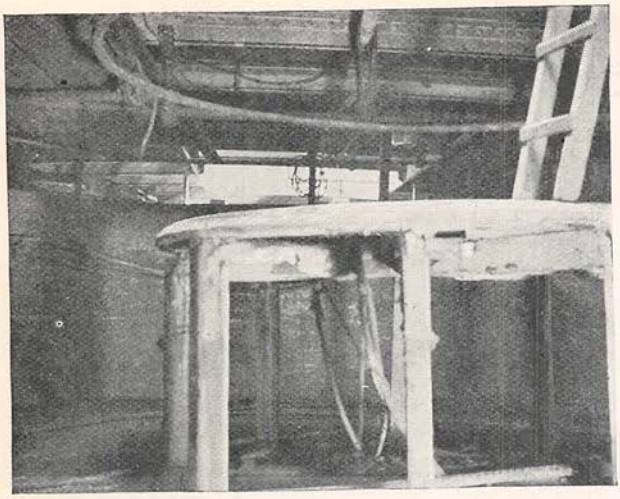


GRAPNELS.



THE CUTTING AND HOLDING GRAPNEL.

The uninitiated reader will probably want to know what the composition of a modern cable actually is; and Mr. Adams is, of course, ready with the information. A cable has three parts, of which the first is the conductor of the electricity, in the centre, composed of seven copper wires wound together into a pliable strand, capable of bearing a weight upon it of over 200 lb. Over this strand is placed a covering or insulator of gutta-percha, necessary because the ocean is a powerful conductor of electricity, and consequently its contact with the unprotected strand would immediately dissipate the telegraphic message contained within. Gutta-percha has stood the test of time admirably, and is the prevailing composite for the insulator, which with a conductor forms the core of the cable. This is again protected by a strong coating of tanned yarn, which forms a soft bed upon which the iron

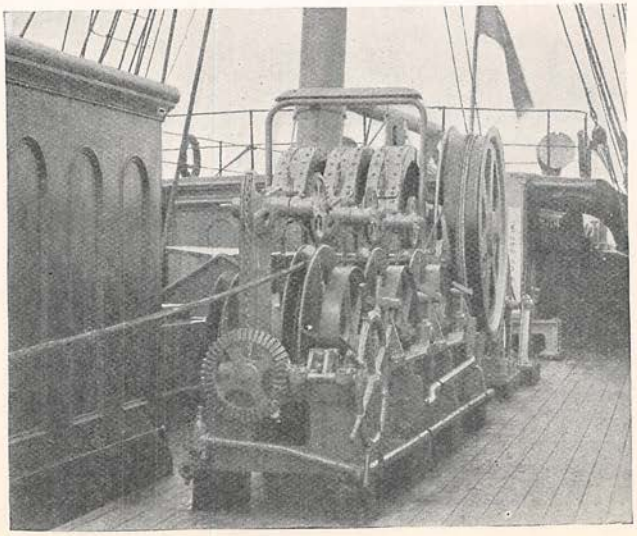


A TANK FOR STORAGE OF TWO HUNDRED MILES OF CABLE.

bars may rest; and the sheathed cable, having been thoroughly hardened and finished, is ready for laying.

Well, then, 500 miles of this finished cable are stored away in the three tanks described above; another tank is on board, and this holds the heavier or shore-end cable. The cable, of course, is "paid out" into the sea by means of powerful machinery fixed on the main deck; and there is also distinct mechanism for lowering the grapnel into the ocean for the purpose of hauling up the damaged line. A dynameter, for measuring the strain brought to bear upon the grapnel rope or cable, is placed midway between the guide pulleys on the fore-castle deck, which is large enough to allow ready work being carried on when the cable is on board, or when a final splice is being shipped. Just above the spar-deck appears the picking-up drum, round which the "bilious" cable is wound by steam. Suitable drawing-off gear exists for pulling the cable on deck after it has passed the picking-up drum and allowed it to pass temporarily into a vacant tank. There are smaller tanks for stowing the grapnel and other ropes; the chart-room, near the steering-wheels, one of which is above deck and the other below, has already been mentioned, and above that is the light pilot bridge. Officers' and steward's quarters, the saloon, and other essential accommodation for the crew, complete the make-up of the steamer, with the exception of the testing-room, to which important factor in the success of every expedition let us now make our way.

In glancing round the testing-room, and in conversing with the electrician, one is again very forcibly reminded what an omnipotent scientific factor electricity is. By means of its agency those on shore are enabled to ascertain where the "fault" (or break) in the cable lies, and thus have they the means, though the catastrophe be 2,000 miles from land, of directing the cable ship where to proceed with its bandages and splints. The method involves a little technical knowledge in grasping its working, but, put briefly, the defaulting spot is discovered by measuring the resistance of the current before and after the accident. The limit of resistance of the cable, calculated in ohms, is ascertained and registered on a finely balanced instrument, to be found in the electrician's cabin, and known as "Wheatstone's Bridge"—a machine by which the electrician can measure the resistance of any conductor between 1 and 1,000 ohms. Resistance practically ceases at the point where the conductor makes any considerable contact with the water; consequently, if, when measuring to locate a break, the apparatus



THE "PAYING OUT" GEAR.

indicates a resistance, say, of 900 ohms, the position of the fault (the resistance of the cable being, say, 3 ohms per nautical mile) will be 300 miles from the shore. With this information, the captain of the cable-repair vessel can estimate, by the aid of his charts and diagrams, the latitude and longitude of the breakdown. He can proceed there with certainty to effect the cure.

PURCHASE FOR HAULING UP THE CABLE.

The testing-room is a very neatly arranged chamber, lit by electricity and having an adjacent cabin on its left in which the head electrician sleeps. Every instrument is so carefully fixed and arranged that, rough as the elements outside may be, it remains perfectly placid and uninjured. Once, during a heavy storm, the door was forced open and the whole paraphernalia given an unseasonable bath of salt water, but their judicious placement stood them in good stead, and scarcely any appreciable damage was done. It is really wonderful to think that, no matter what position in the deep ocean they have reached, the electricians in this little room can keep up a constant and minute inquiry with their fellow electricians on shore. For by this means not only is the new cable as it is laid bit by bit thoroughly tested from *terra firma*, but valuable electrical data are obtained for future use in case of faults and also for the detecting of the slightest fault.

THE ELECTRIC TESTING-ROOM, S.S. "MINIA."

What are the causes for a breakdown in the cable? This seemed a natural question for us to ask the electrician.

"There are," he replied, "about half a dozen, though it may be that science has not yet discovered some of the powerful destructive agents which, I may say, assist to give us our daily bread. The anchors which careless fishing vessels let drag on the ocean's bed are one of the chief causes of faults; another are the teredos, or marine animal borers, which eat into the cable and eventually penetrate its outer cover. These little insects (or should it be fishes?) are to be found principally off the coast of Ireland, and they eat enough gutta-percha in the year to convert themselves into fairly good tennis balls. Then shipwrecks have been known to foul a cable and render it useless for the time being; and lightning is said to have some effect, though I myself am a little sceptical on the point. But decay is perhaps the greatest evil. I have known cables last thirty years in perfect condition, and similar lines, for some inexplicable reason, decompose in several places after the briefest of lives. The life of a cable is like that of an active soldier, uncertain."

Having taxed the electrician, we are now able to return to the chief-officer and ask him one or two questions about the method

Photo by Notman, [*Halifax, N.S.*

CHIEF-OFFICER ADAMS, S.S. "MINIA."

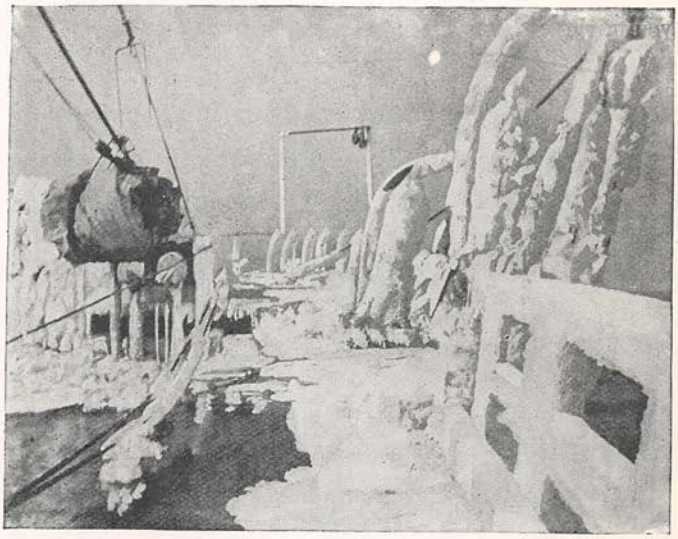
Photo by Notman, [*Halifax, N.S.*

CAPTAIN DECARDARET, S.S. "MINIA."

of hauling up the cable monster from its watery castle for the purpose of administering repair. It may be that the fault calls for only a yard or two of new cable—a short space—or, on the other hand, several miles of new stuff may have to be paid out. The tiresome job, our informant explained, consists not so much in mending or laying the cable—that is comparatively easy when the sea is fairly calm—but in tracing it and getting it up on board.

How is this accomplished? Well, the first thing to be done, when the captain has brought the ship to what he imagines to be the *locale* of the fault, is to take a sounding and to float marked buoys, lighted at night, for the purpose of keeping a course clear for operations. Having accurately ascertained the depth of the water, the nature, if possible, of the bottom, and the direction of currents and winds, the operators begin grappling. There are, we were told, four kinds of grapnels—the long-toed, the short-toed, the centipede, and the chain; the third is the most frequently used. Attached to about fifteen fathoms of ¾-inch grapnel-chain, the great metal hook is hoisted over the side; and the rope, running merrily on a drum, passes over one of three pulleys. By means of the rotometer or length-measurer, the officer in charge is able to ascertain when the picking-up gear is nearing the bottom, and then "dragging"

commences. The ship's head is brought round to the wind and tide, and a careful watch is kept on the instrument which records the strain on the grapnel. An increasing strain denotes the joyful fact that the "cable is collared"; but a sudden and jerky strain indicates "rocks engaged." Great experience is essential to distinguish between a good or a bad strain, and between good or bad ground.



SNOWBOUND OFF NOVA SCOTIA.

The cable "collared," it must next be brought up; and this is a task which requires the utmost care and the greatest discretion. The speed of the picking-up gear has to be very nicely regulated; no surging or jerking must be allowed, lest any such cause further damage to the coil. Only under exceptional circumstances can more than 1,000 fathoms of cable be brought up on the bight without breaking. When the coil leaves the sea it is elevated to the bow of the ship and "stoppered" on each side of the grapnel nip with lengths of strong rope. It is then cut, and the heaving-in commences, in order that the exact scene of the fault may be found. Sometimes this is a tedious and laborious process, requiring the examination of many miles of sound cable; frequently, however, the electrical test has performed its functions with such accuracy that the fault very soon shows itself. And when this has been brought to line the operation of "doctoring" is not very complicated; the cable has to be spliced and joined, then coated and tested, and it is ready to be put back again into its damp bed. This last action has, of course, to be performed with due care, lest the coil should dismember itself again; and a full and systematic record of its position in the ocean has to be entered in the books of the Company.

WAITING FOR THE ICE TO MELT OFF NOVA SCOTIA.

"Life on a cable hospital," remarked one of the officers, "is interesting enough when we can work; but it happens very often that the sea is so rough and the elements so boisterous that all operations are out of the question, and the *Minia* has simply to lie as low as she can until the storm

is over. This is monotonous and trying, as you might expect. Then, we are sometimes ice-bound for weeks together; the *Minia* is held fast in the clutches of a great swaying mass of icebergs. Here is a photograph taken off Nova Scotia, which depicts our happy little band engaged in a mild picnic on the ice. Cables and cable-repairing are at this period of enforced inactivity as remote from us as the North Pole! we are quite *hors de combat*."

"And the dog?"

"Oh, Rover! Good old Rover! He's been with us now for nine years; belongs to the captain, and has never been more than 200 yards from the *Minia*. Quite an institution, and knows more about faults, ohms, and grapnels than do a hundred landsmen. Don't you, Rover?" as the latter-day "sea-dog" came trotting along the main deck to take part in the ceremonial of our departure.

Remarkable as we have very rightly considered the work dealt with in this article to be, and wonderful, in its kind, as the Atlantic Cable's original invention has proved, the world of science remains essentially one in which "the old order changeth, yielding place to new," and to-day the world is following with keenest interest the young Marconi's growing success with his infinitely more wonderful trans-Atlantic wireless telegraphy. A cable, marvellous as it is, maintains a tangible and material connection between speaker and hearer: one can grasp its meaning. But here is nothing but space, a pole with a pendent wire on one side of a broad, curving ocean, an uncertain kite struggling in the air on the other—and thought passing between. And the apparatus for sending and receiving these trans-oceanic messages costs not a thousandth part of the expense of a cable. It is true that Marconi had already convinced the world of his ability to transmit messages for short distances without wires; yet his earlier successes seemed in no wise to prepare the public for his greater achievement. Earlier in last year he had communicated about 250 miles between stations on the British coast, but who imagined that he would suddenly attempt nearly eight times that distance? And now he has achieved the impossible.

The present article will be followed in the May WINDSOR by an elaborate account, obtained direct from the inventor himself, of Marconi's crowning triumph.

"ROVER," NINE YEARS ON BOARD THE "MINIA."