The Wireless World.

With which is incorporated "The Marconigraph."

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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THE
WIRELESS WORLD
with which is incorporated
The MARCONIGRAPH.

Vol. 1.—No. 1. (NEW SERIES) April, 1913.

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"The Wireless World" and its Objects.

WITH this number THE WIRELESS WORLD makes its *début*. Its striking and appropriate cover, which we do not think will be regarded as devoid of artistic merit, should make it even more familiar than the red and black design which for two years adorned the cover of the popular MARCONIGRAPH, now merged into the present publication.

THE WIRELESS WORLD will still be the medium, as was THE MARCONIGRAPH, for the interchange of ideas concerning the further scientific and commercial development of wireless telegraphy, with its bearing upon national and economic interests. But these long words do not mean that we intend to take up the standpoint of a dry and educational science. Our Magazine is to be popular, and while the information we shall print will compel the attention of the scientist, it will not be beyond the scope of the general public.

But there is one especial feature in the development of wireless telegraphy which can no longer be overlooked, and which urges us to devote an important section in each forthcoming number of THE WIRELESS WORLD to its study—that is, wireless telegraphy as a factor in national defence. Its importance in this connection was made a subject of special reference by the delegates of the Government of the United States of America in their report to Congress upon the International Radiotelegraphic Convention signed in London last summer. They stated that particularly in Great Britain and Germany was the fact recognised that radio apparatus is an important weapon of war, and that international safety may be involved in the delay in developing and extending radiotelegraphy concomitant with the advance made by rival Powers.

If the situation has been accurately described—and we do not think there will be found anyone to doubt it—it raises the question of training for men who may be able to operate wireless apparatus and maintain communication with every part of the country in times of national danger. It is not enough to perfect the machine if there is no person sufficiently experienced to take charge of it. Here we think we can be of some service in creating a sufficient supply of trained operators to serve the State. Already we have made some advance in this direction by assisting organisations, such as the Boy Scouts' Association and the Church Lads' Brigade, to make themselves efficient in this branch of national service.

Now we have arranged for a special course of lectures for wireless amateurs to appear month by month, and at the same time we shall devote several pages to matters both topical and technical which may be of interest to such readers.

This, then, is our policy: to be of use and interest to our readers, and through them to be a factor for progress; and if the success of THE MARCONIGRAPH was indicative of public appreciation, we believe that THE WIRELESS WORLD is on the high road to popularity

GUGLIELMO MARCONI, Esq., LL.D., D.Sc.

Commendatore G. Marconi

APRIL 25th is a notable occasion for the wireless world—it is the birthday of Mr. Marconi. If such an occasion as this were to pass unacknowledged, the oversight would show great want of appreciation for a benefit intimately affecting the progress of man, and THE WIRELESS WORLD would deserve—and rightly deserve—the condemnation of its readers. But considerations greater than these urge us to wish Mr. Marconi many happy returns of the day. We are compelled by our admiration for his magnificent and public-spirited work, and by the realisation of the great benefits which he has conferred on humanity, to offer him the tribute of our good wishes.

The life of Mr. Marconi is too well known to need a repetition here. Born at Bologna in the year 1874, he first began to interest himself in the problem of wireless telegraphy in 1895, so that he was only twenty-one years of age when he first put to practical use Hertz's principle—that an electric spark brings about the radiation of electric waves, which may be reflected, refracted and polarised like those of light. With a power and insight which, if he had lived a century earlier, would have been deemed occult, he found the bridle which controlled this Pegasus of the air, and as a result our second Prometheus brought down to earth "radiotelegraphy."

It is difficult to explain the phenomenon of genius. It comes so seldom that it defies analysis. How is it given to one man to seize on a truth which, like a will-o'-the-wisp, has eluded the earnest and oftentimes painful and life-long researches of those who have gone before?

It does seem, however, that a genius may be accurately termed a mutant. A mutant is a species, be it a plant or animal, which springs up none knows whither. A well-known example is the copper-beech tree. The parents are ordinary and familiar trees which abound in the northern forests, but suddenly there arises a glorious scion of the race, more glorious than his ancestry, standing out a noble specimen of arboreal perfection, with leaves of magnificent copper throwing purple shadows, and, as they catch the glint of the sun, flaming up into innumerable tongues of shifting fire. In the same way a genius arises amongst the children of men.

But there is another extraordinary phenomenon to be observed with genius—that is, the swiftness with which his message is seized upon by the crowd and applied by them. A great truth which has required a brain above the ordinary to evolve, as soon as it has found a mouthpiece, is taken and adapted to the various needs of mankind, so that ere its reception is many years old it has become a glib phrase in the mouths of men. Again, if it is an applied discovery, it is handled and made use of, without question, by thousands who themselves would be utterly incapable of adding a jot or tittle to the sum of human knowledge. But the extraordinary part is that recognition is so often denied to its real possessor, and Galileo is imprisoned for his pains.

Fortunately this has not been the case with Mr. Marconi. The world has acknowledged its indebtedness to the great inventor, and nation has striven with nation to do honour to so universal a benefactor.

Mr. Marconi has followed his own splendid vision with an earnestness that would alone command admiration. His example has inspired those whom he has gathered around him to aid him in his work, and when we contemplate the noble edifice which his labour has set up we cannot but feel how well the words of a brilliant dramatist may be applied:

"With all time for its woof and all space for its warp—
Its web is so boundless, so majestic, so mysterious,
Stretched from star to star through the infinities,
That reverence becomes us better than criticism."

NOTES OF THE MONTH

EXPLORING THE INTERIOR OF THE EARTH. PROSPECTS FOR WIRELESS TELEGRAPH ENGINEERS. RELIEVING BROKEN LAND LINES. THE "SCOTIA" AND HER MISSION. THE SHARE MARKET.

THE number of new uses for wireless telegraphy seems to have no end. For some time past a great deal of interest has been taken in "wireless," applied to aeroplanes and airships, and recently good results have been obtained which indicate that the application will have a great value in warfare. Now there comes another application, on lines, surely, as widely divergent from those just mentioned as is conceivable; for not only is it essentially a peaceful application, but geographically it presents an equally distinct contrast. In the last Home Office Report by the Chief Inspector of Mines there is an interesting passage dealing with recent experiments with wireless in mines. The experiments especially referred to have been carried out by rescue brigades and others in the North of England, and communication was established satisfactorily between the surface and the men in the workings close upon 800 ft. deep. No detailed description is given, and no hint is afforded as to which of the multitudinous ways of telegraphing wirelessly on such a miniature scale was adopted. On the whole, one would be inclined to favour for this purpose a return to some of the earlier forms, such as those studied by Sir William Preece about thirty years ago. A certain amount of care would have to be taken to avoid all risk of sparking being induced accidentally in metal bodies, such as rails, especially in coal mines; but apart from this, the problem does not appear to present any difficulty. It would seem that a system of telephony would meet the necessities of the case even better than telegraphy. The Report states that the experiments are to be continued, "as the possible advantages of such a means of communication are at once apparent, and open out a very interesting field."

Those in search of a career for their sons, and young men in technical colleges who are considering to what branch of engineering they should devote themselves in post-collegiate days, would be well advised to read carefully the article entitled "The Wireless Engineer," which appears elsewhere in this number. There they have a clear statement of the qualifications that are necessary for those who desire to enter the profession, and of the conditions which they will find when they get there. No attempt has been made to paint the prospects in the glowing colours that serve to attract the type of young man who wishes to find an "easy" vocation, for it must be evident to anyone who reads the article that the indolent mediocrity would be hopelessly unsuited for the work; nor, for that matter, is he desired. On the other hand, the earnest, hardworking, and capable student should seriously consider whether he would not serve his interests better by turning his attention away from the crowded branches of the engineering profession to one which affords him far greater scope for the display of his talents and the exercise of his individuality. Wireless telegraphy is a comparatively new branch of engineering, and is therefore not yet overcrowded. The work is of such a character that it tends to the development of a sound all-round engineer who is of greater value, and has a higher earning capacity, than the man whose experience lies in only one branch of engineering. With the prospect of extensive travel and a good salary, an able engineer and resourceful man should have no fear of his future success, and the field which still awaits investigation should act as an additional inducement to him. So important is the future of the wireless engineer considered that in some colleges special

classes have been instituted with a view of equipping young men to follow this career, and we hope that these examples will not be lost on other directors of technical colleges.

* * *

The frequent interruption of the telegraph service in the north of Scotland, occasioned by severe storms in exposed parts of the country, has naturally led to the demand on the part of the local authorities in Aberdeen, Dundee, and Arbroath for some more reliable means of communication; and one of the suggestions made to overcome the trouble is the introduction of a wireless service. The adoption of wireless telegraphy is a solution of the difficulty which could be brought about without undue expense. Recent experience in the Channel and Scilly Islands, when heavy weather broke the cables, has rendered the inhabitants there enthusiastic for a wireless service resort to save local fruit and flower-growers from the heavy losses that threatened to result from the complete disorganisation of the cable service. Indeed, as we noted last month, so impressed was the Post Office with the value of the wireless service which was hurriedly established in the Channel Islands, that it has been determined to establish a permanent station at Fort George for use on future occasions of stress. Scotland could hardly do better than learn from the experience of the islands in the south.

* * *

The departure of the *Scotia* to patrol the waters of the North Atlantic, and to collect information regarding the movement of ice in that region, is an impressive reminder of our dependence upon wireless telegraphy for the safe navigation of the ocean. Memories are often short-lived, and in one sense it is well that we should be able to shake off the sad recollection of some ocean tragedy. But in the agreeable facility to forget there lies the danger of overlooking lessons by which we may profit on the recurrence of similar occasions. A disaster which brings home to us the uncertainty of life at sea not only stirs us to pity for the poor victims, but fires us with the determination to pursue the investigation of means by which the terrors of the sea might be mitigated; but it generally happens that the impulse to action weakens in proportion as the memory of the event fades. The mission of the *Scotia*, however, marks a different spirit, and the British shipping companies are to be congratulated upon the practical step which they have taken, in conjunction with the Board of Trade, to safeguard life and property at sea. The *Scotia* may prevent many a wreck by its timely wireless warnings of icebergs, and may even prevent another terrible disaster such as occurred last year. As she will have an expert meteorologist on board, she may also be useful in imparting information by her Marconi installation of the intensity of any cyclonic storms she may encounter, and by which other ships may be struck. It is not difficult to estimate the benefits which must accrue to shipping from the mission of the *Scotia*, and we should not be surprised if the results justified the work being undertaken annually on a larger scale. Further, it is not unnatural to suppose that it may lead to the development of a more complete organisation for the despatch of advices to the British Meteorological Office concerning the approach of cyclonic storms from the Atlantic. The first indication of the approach of these storms is now sent through stations on the west coast of Ireland, from between latitude 10 degrees and 16 degrees, and many of them are of great practical service in the preparation of meteorological forecasts for these islands. But with vessels of the *Scotia* type, scattered between England and America, direct meteorological information should be available from other parts of the Atlantic, which should make it possible to indicate changes in the weather some days in advance with a fair degree of accuracy.

* * *

Business in the share market has been at a low ebb during the past month. But, in spite of the comparative inactivity of dealings the tone of the markets has been decidedly good, as the result of a further improvement in the political situation in Eastern Europe.

Dealings in the shares of the various Marconi issues have been restricted, but the market has kept very firm.

Prices on March 19th were: Ordinary, 4¼; Preference, 3⅞; Candadian, 15s. 6d.; Spanish, ⅞; American, 1.

CARTOON OF THE MONTH

Wireless Terms Illustrated

"Sigs are Strong"

The Gateway of the East

The Aden-Berbera Wireless Stations

The wireless service between Aden and Berbera has proved of special value for strategic and commercial purposes. Life for the Englishmen who guard these outposts of Empire is not a "feather-bed" one. The following article indicates something of what they have to endure, and incidentally turns the limelight on a fowl with a mania for punctuality.

THOUGH established barely three years—it was on May 14th, 1910, that the stations were completed and handed over to the Government—the wireless service between Aden and Berbera, which was primarily intended as part of the Defence Scheme, has proved so successful from a commercial point of view that attention is being directed to the question of establishing a station at Kismayu on the coast of British East Africa. Kismayu, the capital of Jubaland, lies almost on the Equator, and has no other means of communication than by steamer, which calls once a week from Aden and Berbera with mails and cargo. At Lamu, 180 miles south of Kismayu, it is contemplated to erect another station, and so complete a valuable "chain" from Aden to Mombasa, which is already in telegraphic communication with Lamu.

Aden, which in recent years has been christened the "Gibraltar of the East," assumed an additional strategic importance to the Empire when Britain decided to evacuate Somaliland and confine her activities to the coast. It was then thought expedient that Berbera should be in communication with the outside world. Hence the wireless telegraph stations.

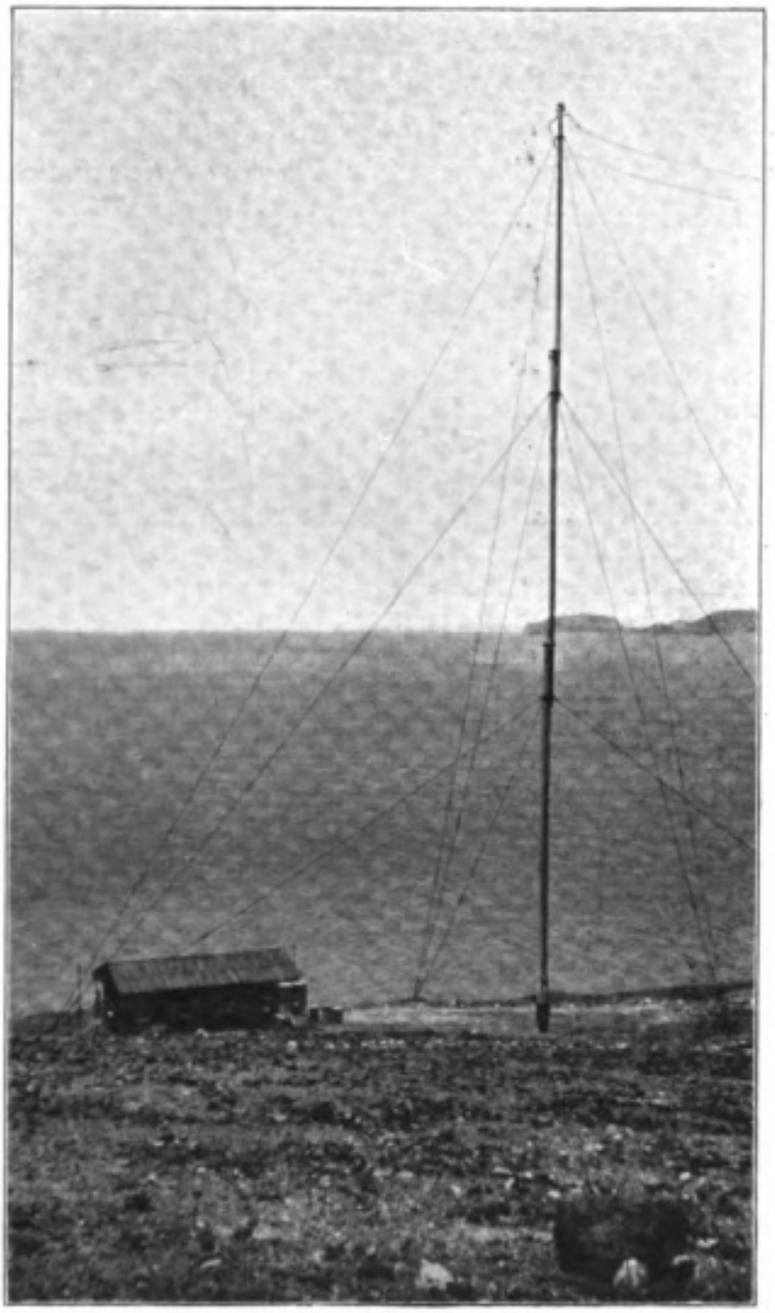
It was, curiously enough, a shipwreck which added this second Gibraltar to Britain's possessions. Sailing under the British flag, a vessel was wrecked off Aden harbour in 1837, and the passengers and crew robbed and grievously maltreated by Arabs. When the Bombay Government demanded an explanation of the outrage the Sultan of Aden promised to make handsome compensation for the plunder of the vessel, and even agreed to sell his town and port to the English. While negotiations to this end were being undertaken by Captain Haines, of the Indian Navy, the Sultan died, and his son refused to fulfil the promises his father had made. A combined naval and military force therefore bombarded the port, which capitulated and was annexed to British India in January, 1839, being the first accession of territory recorded in Queen Victoria's reign.

Ere Britain, through the British East India Company, took the reins, Aden's career had been a chequered one. At many periods of history it held, as the chief trading city on the coast of Arabia, a big reputation. It has been identified, though rather speculatively, with the Eden of Ezekiel xxvii. 23, and was certainly an entrepôt of commerce between the ancient Roman Empire and the East. The Romans, indeed, probably captured it about 24 B.C.; to them it was known as Arabia Felix. But a few years after 1513, when the Portuguese under Albuquerque unsuccessfully attacked it, Aden fell into the hands of the Turks and was fortified by them in the reign of Solyman the Magnificent. Later it passed into the hands of the native Arab chiefs.

Shrunken almost to insignificance when it fell into Britain's hands, Aden—especially since the opening of the Suez Canal in 1869,

nineteen years before which it had been made a free port—has increased astonishingly in commercial importance. Every year over 2,500,000 tons of shipping visit the port, from which Arabian coffee, gums, spices, ivory, ostrich feathers, hides and pearls to the value of £2,250,000 are exported.

Aden strikes the eye as purely utilitarian; it is a great strategical position, a vast natural fortress, and that is all. From an æsthetic point of view it is "damned with faint praise." Drear and desolate is its aspect from the sea; like a lifeless drop-scene, its precipitous bulk stands barren against the limpid waters of the bay. Like shanties on a cinder-heap, sundry buildings sprawl about its base as colourless as the mountain behind them. It is a drab spot, this scorched volcanic waste, one that not even the most ardent house agent could label as "desirable locality."



Aden Wireless Station

Yet people, apart from the garrison, do live there—a cosmopolitan crowd of 45,000. Why, heaven alone knows! Perhaps on nearer acquaintance Aden, like cheese, improves. The town, a depressing collection of stone and mud buildings, a few of which attain to the dignity of two stories, and the military cantonment—the Aden brigade belong to the western army corps of India—are within the crater; the Europeans have pitched on Steamer Point as a rather cooler spot. Here in a fiery but not unhealthy atmosphere the little world of Aden, importing all its food, endures life perpetually athirst. Aden is as dry as a bone. A little water is obtained from the wells within the valleys of the crater; much is condensed from sea water; for washing, it is led by means of an aqueduct from Shaikh Othman.

Next to the camels, a quarter of a million of which lope into Aden annually with produce from all parts of Yemen, and squat, chewing, chewing, chewing, in herds about the highways to the great inconvenience of the pedestrian, the great feature of the place is, if one except the snakes, the scorpions and the printing press in the local gaol, the water tanks.

In a hill gorge just above the old Arab town they lie, basins of rock to store the occasional heavy showers in the hill region. They were probably first made about 600 A.D.,

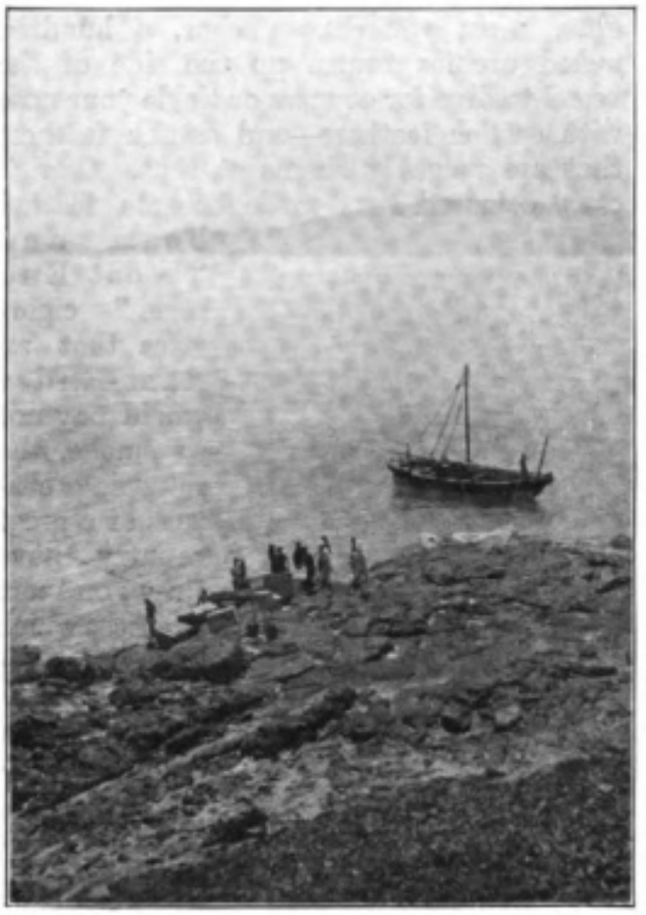
when Aden was a calling place for Arab and Egyptian vessels engaged in trade between the Red Sea and Somaliland, Southern Arabia and Western India. There are now some thirteen of these, capable of holding nearly 8,000,000 gallons of water; but there are said to be in all fifty, which, if entirely cleared out, would have a capacity of some 30,000,000 gallons. Thus, then, is displayed the vital importance that has been attached to the water supply in this arid region.

The earth round the tanks is rich with tropical vegetation, on which the eyes, weary of dust and rock, rest with gratefulness. In the hill gorges a wealth of lilies, acacias and aloes occasionally surprises the eye; here are the grapevine, the figs, the date-palms and even frankincense trees, which famed Aden abroad as Arabia Felix amongst ancient nations. Even now Aden ships large quantities of incense to the Mohammedan States of India.

But Aden without the P. & O. boats would be like Cambridge without the university. The whole occupation of the natives would be gone. In a fog of coal dust, when you drop anchor, a hundred naked urchins swarm up the side of the vessel to dive for coppers or tickle your nose with ostrich feathers—and ostrich feathers that are palpably shams at that. Ostrich eggs, coloured hand-made baskets, feather boas, and "West End style" cigarettes that an East-Ender would pay not to smoke, the returning citizens of a great country have thrust on them at prices which steadily diminish as sailing time draws nigh. Salesmanship in Aden has reached the high-water mark of insistence, or Aden could not live. He is a strong man who can withstand their importunities—or smoke their cigarettes.

Berbera Wireless Station

On the Elephant's Back, a rocky promontory sloping down to the sea three miles from Steamer Point, off which the native chafferer daily "does" the Britisher tourist, lies the Aden wireless station. Above it stands Marshag Lighthouse. The erection of the Aden station was quite a notable feat of construction owing to the difficulty of approaching the site by road. Required in a moment of urgency, the houses to contain the installations were shipped out from



Landing material on Elephant's Back

England in portable wooden sections, the intention being to erect a permanent station at a later date. Arrived at Aden, the plant had to be landed on the beach and hauled up the precipitous slopes to the chosen site. Under a broiling sun the work went on expeditiously and was finished well within contract time.

The Aden installation is a Marconi 1½-kw. standard set, consisting of a rotary converter, transforming half-plate condensers, bulb spark discharge, adjustable transmitting jigger, chokes and inductances in the transmitting gear, and multiple tuner and magnetic detector in the receiving circuit. The power is derived from a 5 B.H.P. oil engine, and the battery consists of 54 cells of 150 ampere-hour size. The aerial is suspended from a mast 185 ft. high, the wires being carried out to 50-ft. extension poles. The aerial, a "four wire one," is arranged partially directionally. The Aden station is connected by land line to Ras Boradli, the Eastern Telegraph Company's cable station in the town.

Due south of Aden across the Gulf lies Berbera. It is the one green spot in a sandy plain which stretches away twenty miles to a high range of hills which are said at one time to have formed an unbroken chain from Somaliland to the volcano at Aden. The green relief is a plantation of trees round the Residency and Government bungalows. This oasis is known as "the Shaab." Surrounded by a 10-ft. wall with gun bastions at intervals, it is strongly fortified and guarded by a company of Indian soldiers. Within this area is the wireless station. The mast is erected just outside the gaol, and the aerial wires extend over the military lines.

There are less than a dozen European resident officials on the coast, the clerical staff, including the wireless operators and land-line signallers, being Eurasians and natives. The operators for the Aden-Berbera service were recruited from the Indian Telegraph Department, without previous wireless experience, and have shown themselves good and keen workers. Three operators and one engineman comprise the staff at each station. At Berbera two Somali telegraphists who had been working on the local land lines were trained as wireless men.

Since the opening of the Aden-Berbera

Linesmen attached to Land Lines

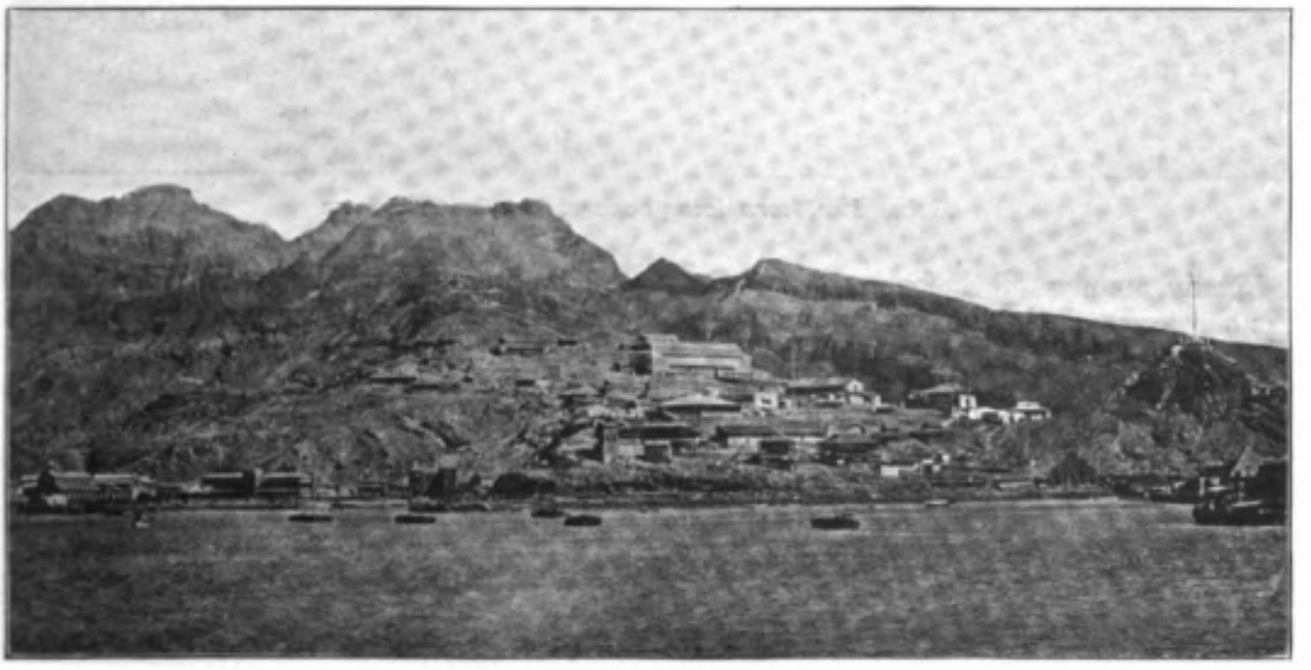
service for the exchange of public telegrams the traffic has increased every month, the chief source of revenue to the stations being from messages received from ships. Local merchants use the service to some extent in connection with the fluctuating prices of the country's chief exports—live stock and hides. Valuable meteorological information is transmitted from Aden, from whence, too, assistance can be readily obtained, as the cases of the *Trieste* and the *Fifeshire* prove. It is hoped shortly to recommence the daily transmission of Reuter's news telegrams to Berbera. This will mean the handling of a quarter of a million additional words annually.

For six months of the year Berbera awakes from its apathy, and its normal population increases from 10,000 to 30,000. From October to May the town hums with life. This is the time of the Great Fair, to which come hundreds of caravans from Ogaden and Dolbahanta carrying the produce of the interior. Camels and vans pitch in the native town one mile from the "Shaab"; tents are unslung and mingle quaintly with the one-storied, flat-roofed, rubble native houses. All day long the din of bargaining is heard; sheep and goats, gum, resin, skins and ostrich feathers add an atmosphere to the picture. May comes and the hucksters steal silently away; Berbera looks quite deserted.

The Europeans enjoy a little fishing and tennis.

Not an eyebrow has been raised by the Somali at the introduction of wireless telegraphy at Berbera. The machine guns and traction engines of great expeditions into his country have come and gone, and nothing that the white man can produce will occasion him any further surprise. Besides, the Somali suffers from *Wanderlust*, and his travelling has made him wise and taught him a familiarity towards things mechanical.

A little hobby of several notable Somali chiefs is to come down to the station to see "the devil," "the devil" or *shitan* being the spark, in the presence of which they exhibit, it must be confessed, a particular good-humour.



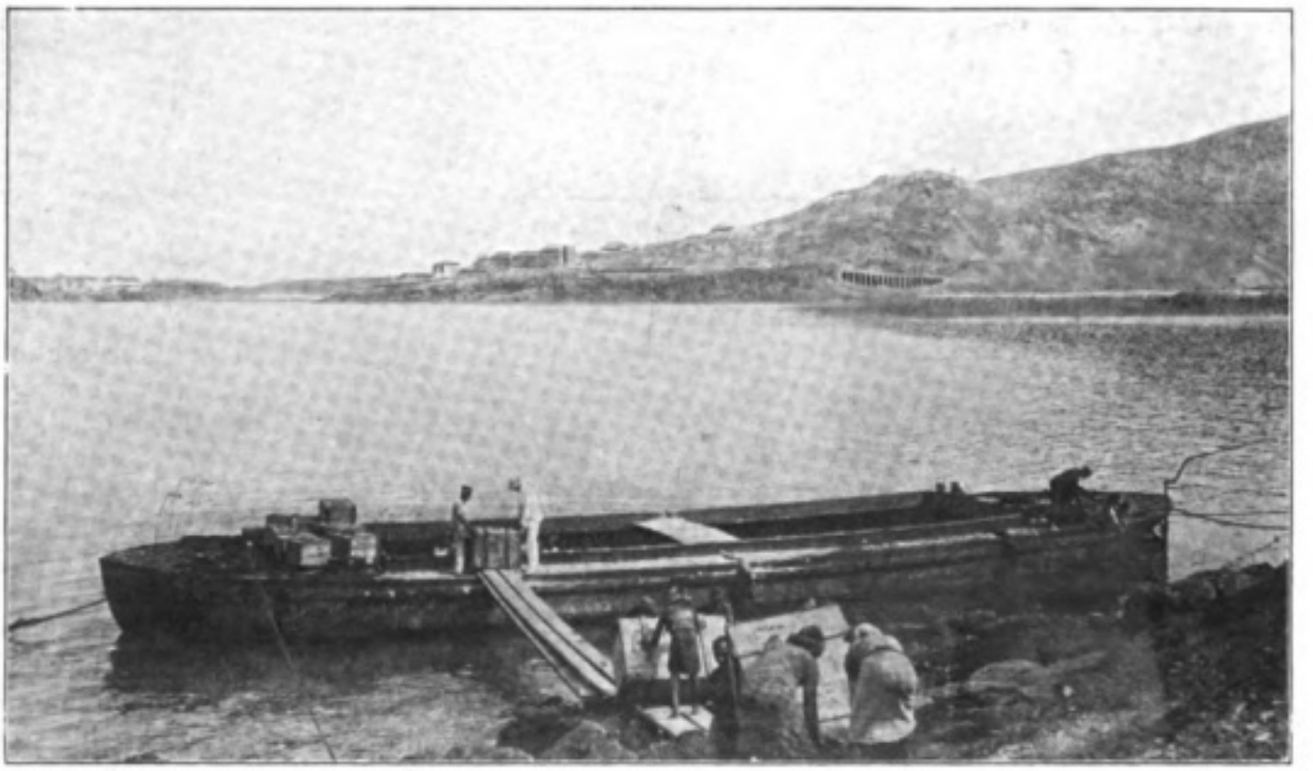
A View of Aden

"Wireless" has pleased another section of the community in another way. Berbera is by no means a cool spot. Indeed, in the hot weather from May to September, when the "Khariff" or hot blast blows continuously for days, the temperature not seldom rises towards 120° in the shade, and in the cool season is seldom lower than 90°. The recent "winter," if it may be so termed, was exceptionally cool and extraordinarily cloudy. For this boon many old native residents in the bazaar are blessing the "wireless," to which they attribute a season of unusual comfort.

Beluchi soldiers doing concrete work at Berbera

Finally, amongst all the boons that wireless has showered on the Berbera community, it has done splendidly for the local eagle.

Promptly at 6 p.m. every night the fowl alights upon the wireless mast. He has not missed his way for a year of nights. Hunched upon the truck of the top-gallant, he roosts —the Mascot of Berbera.



The difficulties of landing materials at Aden. 150 ton lighters must be anchored well out through danger of breaking on the rocks

Berbera Station

1. The Station. *2. Operator Receiving.* *3. Converter and Switchboard*
4. Instrument Room.

An Atlantic Sentinel

The *Scotia* and Her Wireless Equipment

SIR H. LLEWELLYN SMITH, when he went to Dundee on March 8th to speed the men who went out in the *Scotia* to patrol the waters of the North Atlantic and report to ships that pass in the night or the day when and where there is danger from icebergs, conveyed to Captain Robertson, the scientific staff, and the crew a message from the King, expressing his Majesty's special interest and good wishes.

Although the *Scotia* is a full-rigged ship, she is also fitted with engines of 80 h.p., which are capable of driving her at a speed of six or seven knots. Two dynamos have been added to the engine room, each designed for an output of 5 kw. Electric lighting plant has been installed, but the main object of the dynamos is to supply current for the wireless plant and other smaller motors in connection with the various scientific instruments on board.

The vessel is fitted with a Marconi wireless installation having a long range, so that she will be able to keep in touch with the wireless stations in Newfoundland and Labrador. This apparatus has been provided free of charge by the Marconi Company. There are two wireless operators on board the vessel.

A standard 1½-kw. set and emergency gear have been provided, but the station enjoys the advantage of a disc-discharger. The space for the wireless cabin is necessarily small; nevertheless, accommodation was found for a silence cabin. Considerable difficulty was experienced in obtaining a suitable earth connection, as this had not been provided for when the ship was in dry dock. The difficulty was overcome, however, by making a good connection to the upright of the main engine. This proved very satisfactory, as signals were received from Paris, Germany, and Poldhu.

The aerial is, unfortunately, exceptionally small, as the span from foremast to mizzen-mast of the vessel is only 87 ft.; this was compensated for by adding 50 ft. from the foremast down to the bowsprit, which gave a total length of aerial of about 200 ft.

Dundee, where the *Scotia* was fitted, is rather isolated from a wireless point of view, Cullercoats being the nearest public station with which to conduct tests. Thanks, however, to the timely aid of Captain Young, of the Board of Trade, arrangements were made with the Admiralty whereby it was possible to test with H.M.S. *Venus*, and almost at the eleventh hour this ship, which was lying at anchor in the Firth of Forth, reported signals very strong.

As the *Scotia* sailed from the Tay she presented a strange appearance to those of her crew who were familiar with her as a "whaler"; for, under the able supervision of Mr. Boumfrey, of the White Star Line, she was so transformed as to resemble a yacht, with comfortable quarters for her crew.

If scientific instruments of the latest type can accomplish anything, then the success of the *Scotia* should be assured, as the deck literally abounds with weird devices of every description for taking various observations.

A lead pipe runs from the mast-head to the laboratory for measuring various air pressures. Aft is to be found a device somewhat similar to a log line; but instead of the usual thin rope, an electric cable is used. This cable is trailed aft for a considerable distance, and is used in conjunction with the electric thermometer, an instrument so delicate that readings can be taken to the 1/100 part of a degree. Amidships is the laboratory, where all experimental work will be conducted.

A code for use in transmitting wireless reports on ice to the nearest land stations and the steamships on the trade routes has

been issued by the Board of Trade. The information required concerns :—

(1) The kind of ice observed ; (2) the position of ice when last determined ; (3) the direction and rate of its drift when known ; (4) the direction and force of the wind ; (5) the set and velocity of the current ; (6) weather or state of the sky at a fixed hour ; (7) barometer and air temperature : (8) barometric change and sea temperature.

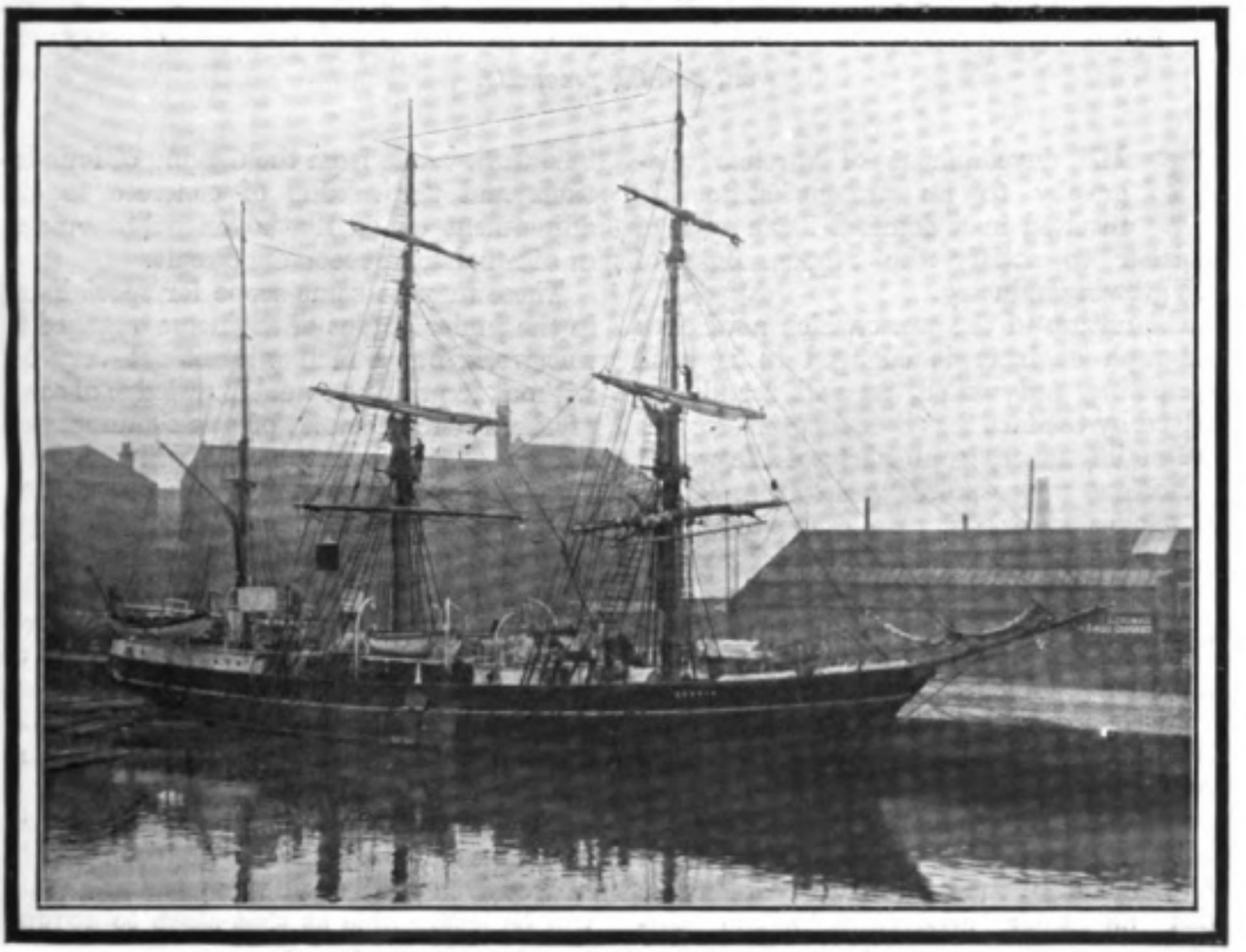
4. Floe ice. Pieces of field ice frozen together.

5. Pack ice. Collection of pieces of ice broken from berg or floe, which have more or less closed together.

6. Hummocky ice. Field or floe ice presenting hillocks.

7. Pancake ice. Cakes of newly formed ice (navigable).

8. Brash (or Sludge) ice. Small p[illegible] ice (easily navigable).



The "Scotia" as she appeared before leaving the Tay

Messages are to be addressed "Meteorology," the absence of any further address indicating the universality of the destination of the warnings.

The code adopted for describing the nature of the ice is :—

0. No ice observed.

1. Iceberg. Huge mass of floating ice.

2. Floeberg (or Growler). Thick piece of salt-water ice like small iceberg.

3. Field ice. Navigable flat ice, extending as far as the eye can reach.

9. Land ice. Field or floe ice attached to the shore since the winter.

The messages will also detail the date, position of the ship, the position of the ice, the date and time of observation, the direction and rate of drift of ice, the direction and force of the wind, the set and velocity of the current, the weather, barometer, and air temperature at eight a.m., the barometric tendency, and the sea surface temperature. All this information will be conveyed by the code in six groups of five figures each.

The Wireless Engineer

Qualifications and Prospects

The article below can be specially recommended to parents and guardians who are considering what to do with their boys, also to young men in technical training colleges who are preparing for a career. It explains what qualifications are required of wireless engineers, the nature and conditions of the work which they have to carry on, and the prospects.

THE development of wireless telegraphy to its present state has resulted in a demand for a type of engineer to satisfy the requirements of this growing industry.

The nature of the work which a wireless telegraph engineer is engaged in is both interesting and varied, as will readily be judged by the fact that it covers the erection and maintenance, in all parts of the world, of stations whose power varies from ½ kilowatt to 500 kilowatts. In the case of a small ship station the installation is, comparatively speaking, a very simple matter. The accommodation and the power are provided by the ship, and the masts of the ship are available for the aerial wires.

But in the case of a high-power station, its erection in a comparatively uncivilised part of the world is a work which requires the resources of first-class mechanical, electrical, and civil engineering. Such work includes the installation of boilers with all their accessories, steam turbines, direct current and alternating current machines, accumulators, switchboards, transformers, etc., in addition to the wireless gear. It also includes the erection of a number of very large masts with the corresponding systems of aerial wires and earth wires.

It might very easily include the construction of buildings and roads, and, as a contrast to all the foregoing, requires the careful tuning and adjustment of the transmitting and delicate receiving apparatus, and, finally, the organisation of a telegraph business which has to work as regularly as if it were on an ordinary land line. The work varies from the digging of foundations and the mixing of concrete to the adjustment of an Einthoven galvanometer or of a balanced receiving circuit.

There may be some scope for specialising in the junior grades of engineers engaged in this work, but a man will not get very far without acquiring a sound knowledge of some of the different classes of work enumerated above. For this purpose he will require a complete general engineering education, including mechanical, electrical, and civil engineering. The order in which these three branches are mentioned may be taken as indicating their relative importance for this work. In the early days of wireless telegraphy the work was of a more purely electrical nature, but this is not the case now. It is the engineer rather than the electrician who is required.

The wireless telegraph engineer should commence on this work as soon as he has received a full engineering training. He will be better able at that stage to acquire the knowledge which specially concerns wireless telegraphy than if he begins later when his mind is set. He need not trouble to acquire any special experience of wireless telegraphy before starting on the work (it is not required of him when he joins), though he will, of course, benefit considerably by reading in his spare time books or articles dealing with the subject. His principal object should, however, be to obtain the best general engineering training that he can afford. There need be very little doubt, nowadays, as to the way in which to set to work to do so, as the most excellent advice on

the subject is given in the following publications:

"Notes on the Training of Professional Engineers," by Professor John Goodman,* and the "Report of the Committee of the Institution of Civil Engineers on the Education and Training of Engineers." †

The specific qualifications required by Marconi's Wireless Telegraph Company of applicants for posts on their engineering staff include the following:

1. A good general education till the age of not less than 16.

2. A suitable general engineering education at an approved technical college or university for not less than two years, with the corresponding certificate, diploma, or degree.

3. Not less than two years' practical experience in a mechanical engineering workshop or other suitable place.

With regard to the nature of the practical work, the most suitable experience would include fitting, turning, forging, assembling, and outside installation of engines, including foundations and the lining up of bearings. Also, if possible, experience in the maintenance of steam plant. Experience as a switchboard or sub-station attendant is not of much use. Experience in large electrical manufacturing works is usually distinctly less useful than experience in moderate-sized mechanical engineering workshops, though there are exceptions to this rule.

It must not, of course, be supposed that a good training will necessarily make a good engineer, and, on the other hand, a capable man can sometimes acquire a good training by methods which differ considerably from those which are generally recommended. In certain cases, therefore, applications are entertained from men who have not exactly fulfilled the letter of the requirements mentioned above.

In addition to adequate training, it goes without saying that a thoroughly sound personal character is required, in evidence of which the strong recommendations of independent persons of good standing are required in support of the application.

As a great part of the work is carried out abroad, robust health and willingness to go at any time to any part of the world form part of the required qualifications. For this reason applicants for appointment are required, if approved in other respects, to furnish the company with a certificate of fitness from a doctor nominated by the company.

If an application appears to merit consideration, the applicant is granted a personal interview in London, with a view of determining his suitability for the work.

The average age at which men are engaged is from 21 to 25.

Men who are considered satisfactory in every respect are taken on probation for a period of three months, with an allowance which is intended to cover the cost of living only, and if a satisfactory report on their conduct and work is received at the end of that time, they are appointed to the engineering staff at a salary which depends on their previous training and experience, and on the nature of their probation report. Generally speaking, the scale of pay is fully up to the best standards of remuneration for fully trained engineers.

The probationary period is ordinarily spent at a special training station, where instruction is given in the principles of wireless telegraphy and in their practical application. As this instruction is of a confidential nature, the probationer is required to sign a strict agreement framed with a view of determining the conditions of his employment, and of securing to the company the full benefit of his services and his knowledge.

As regards general conditions of life, reasonable arrangements are made to cover a man's expenses when he is moved from one place to another. He is expected to be prepared to move at short notice at any time. There is consequently a good deal of change in the early years of a man's service, which is agreeable to a single man, but which would not be likely to suit a married man. The service probably provides unrivalled opportunities to engineers to see the world, as the pages of this Magazine will testify. When engaged on work abroad, a man ordinarily has his living expenses paid, in addition to his salary, and if the climatic or other conditions are bad, he receives a larger salary, each case being decided on its merits.

* Obtainable from the Secretary of Leeds University.

† William Clowes & Sons, 23 Cockspur Street, London, S.W. Price 7d. post free.

The Propagation of High-Frequency Electric Waves along Wires

By JOHN STONE STONE*

Mr. Stone deals thoroughly and authoritatively with a new and promising development in the science of communication. He outlines the fundamental ideas of the method in its simplest form, and describes its application to a pair of duplex stations for two-way transmission for each station, then proceeds to the "more complex, but more perfect" multiplex stations.

FOR the past three years or more Major Geo. O. Squier, of the Signal Corps of the United States Army, has conducted a systematic investigation of the propagation of high-frequency electric waves along wires, and of the practicability of their use in the transmission of signals and of speech along actual telephone cables and air lines. His investigations have also dealt with electrical resonance as a means of segregating, at the receiving end of the line, high-frequency currents of different frequencies simultaneously propagated along the line, and the selective reception of the energies of these different currents, each in a different receiver circuit made responsive only to the variations in the amplitude or strength of the current it is resonantly tuned to receive. The results of his labours are to demonstrate that not only Morse signals but speech may be transmitted over the ordinary telephone cable and pole line circuits, and to very considerable distances, by means of high-frequency electric currents or waves, and that a large number of telegraphic or telephonic messages may thus be transmitted simultaneously over a given telephone or telegraph circuit without interfering with each other through the use of electrically tuned or electrically resonant receivers. Moreover, he has shown that the new high-frequency multiplex telegraph and telephone system may be superimposed on the older systems or the new high-frequency apparatus added to lines equipped with the usual telegraph or telephone apparatus without interfering in any way with the operation of this older apparatus, or being interfered with by it.

Major Squier has dedicated to the public his patents relating to this new art—an act which, though laudable in the spirit it displays, is nevertheless unfortunate, as it is more likely to retard the progress of the new art than to advance it, since what is everybody's business is nobody's business, and capital may hesitate to enter a new field and promote an undertaking in which it is led to believe that it will meet with unrestricted competition as the reward for its enterprise.

ULTRA-SOUND FREQUENCIES.

The frequencies of the electric waves or currents propagated along the wires in this new art are, so to speak, "above the limit of audibility of the receivers" or are ultra-sound frequencies. In other words, each of

* Abstracted from the Journal of the Franklin Institute.

the electric currents propagated along the telegraph or telephone line is of so high a frequency that it can produce no audible effect in the telephone receiver through which it passes as long as its strength or amplitude remains constant. In fact, the frequencies of the currents used in this new telegraphy and telephony are 20,000 or more alternations per second, and correspond, therefore, to the frequencies of the air vibrations of sounds whose pitches are above the limit of audibility of the human ear. In the new telegraphy and telephony the telegraphic signals and the voice are transmitted over the line wire by suitable variations in the amplitude or strength of the otherwise uniform high-frequency current, and the signals and the voice are received in a magneto-telephone receiver connected in a local circuit which includes a device capable of rectifying the high-frequency current used. The rectifier employed is preferably an Audion, though a Wollaston electrode, and perhaps other radiotelegraphic detectors, particularly the so-called crystal rectifiers, may also prove serviceable.

The rectifier in the local circuit at the receiver converts the high-frequency current of the line wire into a pulsating current of double the frequency, or, what is the same thing, it converts the high-frequency current into a normally uniform unidirectional current with a superimposed alternating current of double the frequency of the line current. The telephone receiver is mute to the alternating component of the rectified current, but responds to the most minute variations in the strength of the unidirectional component of this current. Variations in the amplitude or strength of the high-frequency line current are faithfully reproduced in the strength of the unidirectional component of the local receiver current, and in this way the telephone receiver is made highly sensitive to variations in the strength of the high-frequency line currents, while absolutely mute to that current when its amplitude is constant.

The relation of the new high-frequency telegraph and telephone to radiotelegraphy and radiotelephony is to be readily seen in Fig. 1, which illustrates the new system in its simplest practical form. The diagram shows, in fact, two radiotelegraph or radiotelephone stations with a connecting wire between them to guide the waves from the transmitter to the receiver.

In this arrangement the current is supplied by a high-frequency alternating current dynamo, A, which must be capable of supplying 20 watts at 10 volts and at not less than 20,000 cycles per second. In the

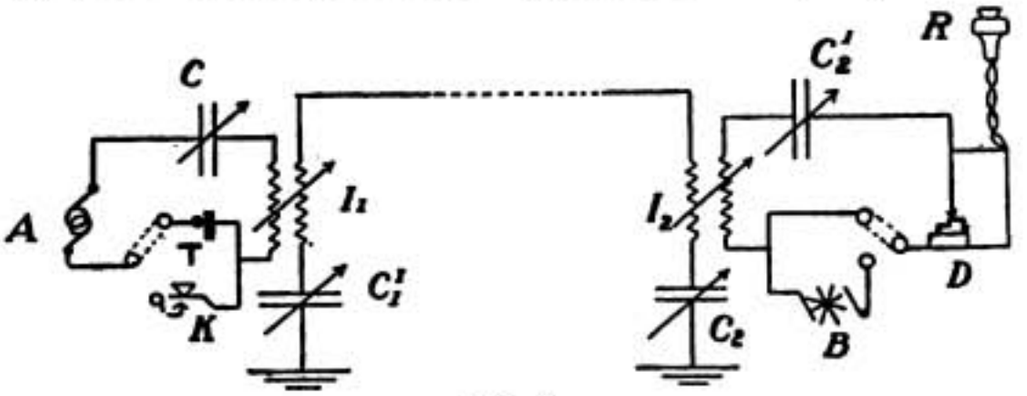


Fig. 1.

case of high-frequency telephony this dynamo has to meet a further requirement which is not demanded of it by high-frequency telegraphy, and this requirement is perhaps the most difficult one to satisfy. It is that the amplitude of the current the dynamo supplies must be absolutely smooth and can have no variations or ripples on it of periods corresponding to the periods of audible tones.

The arrangement of apparatus illustrated in Fig. 1, when the switches at the transmitter and at the receiver are both thrown up as shown, is that of a high-frequency telephone system, while when the switches are both thrown to their lower contact points the arrangement becomes a high-frequency telegraph system, so that the one diagram may be used to sketch the operation and requirements of both the new tele graph and the new telephone.

AN ESSENTIAL DIFFERENCE.

In the new telephone system, when the transmitted T is spoken to, it modifies the amplitude of the high-frequency current in the primary circuit of the induction coil, I_1, in exactly the same way that it modifies the strength of the battery current in the primary circuit of the induction coil in the old telephone system, and, as already described, the telephone receiver, R, at the receiving station responds, owing to the fact that exactly corresponding fluctuations result in the unidirectional component of the rectified current in the local circuit at that station.

In the new telegraph system the operation of the new telegraph key, K, to send Morse signals, alternately throws the high-frequency current on the line, and cuts off the supply of this current from the line. The result of this would be only to make successive faint clicks in the telephone receiver, R, as the current is thrown on and off, except for the periodic interrupter, B, which may be of the nature of a revolving commutator or a mere buzzer. This interrupter serves to break the incoming wave trains constituting the Morse signal elements into a succession of much shorter wave trains having a frequency of about 450 impulses per second, which, when rectified, give rise in the telephone receiver to a high-pitched musical tone of great audibility. The Morse signals are now audible as a succession of long and short intervals of a high-pitched musical sound, as in radiotelegraphy. From the foregoing and the diagram of Fig. 1 the essential difference between the new telegraphy and the new telephony will easily be seen.

SOME CHARACTERISTICS.

Some of the more essential characteristics of the simple system shown in Fig. 1 may prove of interest, particularly as they have not as yet, so far as I am aware, been clearly set forth. The induction coils, I_1 and I_2, are wound without any iron in their cores, since in the first place the presence of iron is not needed to secure a large mutual inductance between the primary and the secondary circuits, because a high degree of coupling between these circuits is not desirable, and, in the second place, the presence of iron in the core of the coils would introduce a loss of energy, through hysteresis, owing to the high frequencies used, which would give rise to an effect equivalent to the presence of a considerable dissipative resistance in the primary and in the secondary circuits. The arrow through the symbols for the coils indicates that these coils are adjustable with respect to their degree of coupling in the same way and for the same reason that the coupling of the corresponding coils is made adjustable in radiotelegraphy and radiotelephony. Similarly, the arrows through the symbols for the condensers, C_1, C'_1, C_2, and C'_2, indicate that these condensers are of adjustable capacity.

The function of the variable condensers at the transmitting and receiving stations is to electrically "tune" these stations. In the transmitting station of the system shown in Fig. 1 the so-called tuning is quite different in the case of the telephone and telegraph systems. In the case of the telegraph the coupling of the coil I_1 and the capacities of both condensers at the transmitter are adjusted with reference to the production of a maximum current in the line wire, as indicated by a hot wire ammeter connected in the secondary circuit. In the case of the telephone system the coupling of the coil I_1 is made very small, and each of the condensers at the transmitting station is then independently adjusted to make the current in the circuit in which it is included a maximum, as indicated by hot wire ammeters connected in each circuit. The coupling of the transmitter coil is then increased till the tuning adjustment of one circuit interferes with the tuning adjustment of the other, and the circuits are readjusted, each by its own condensers, for a maximum of current in itself. The reason for the radical difference in the tuning of the transmitter station in the telephone and telegraph systems may not be obvious. It is due to the fact that in the telegraph it is the actual amplitude of the high-frequency waves propagated along the line that determines the strength or loudness of the signals heard in the receiver, while in the telephone system it is the magnitude of the variations in amplitude of the high-frequency waves propagated along the line that determines the loudness of the received speech. Moreover, in the case of the telegraph the loudness of the received signal is the sole object, while in

the case of the telephone a still more important requirement is excellence in the quality or articulation of the transmitted speech. In the case of the telegraph, therefore, the adjustment of the transmitter station is such as to produce the maximum amplitude of the transmitted waves, while in the case of the telephone system the adjustment is primarily adapted to securing the best quality of the transmitted speech, and, incidentally, to produce the maximum variation in amplitude of the transmitted waves.

VARIATIONS IN AMPLITUDE.

Thus, by loosely coupling the primary and secondary circuits at the transmitter and then adjusting the primary circuit for a maximum of current, the reactance of the primary is made zero, and the impedance of the primary is reduced to the mere resistance of that circuit, so that the resistance of the telephone transmitter becomes practically the sole factor in determining the primary current. Obviously this makes the variations in the amplitude of the high-frequency current due to variations in the resistance of the telephone transmitter a maximum, and, on the other hand, telephone engineers will realise that the elimination, so far as possible, of all reactance and resistance except that of the telephone transmitter, from the primary circuit at the transmitter station, is a requisite to good quality or articulation of the transmitted speech.

At the receiving station of the system shown in Fig. 1, whether it be used as a telegraph or telephone system, the tuning of both primary and secondary is directed merely to the production of a maximum current in the secondary circuit, and for this tuning the telephone receiver is used as the indicating device, since the current at the receiving station is not sufficient to permit of the use of a hot wire ammeter. A sensitive galvanometer may sometimes be used with advantage for tuning purposes in place of the telephone receiver.

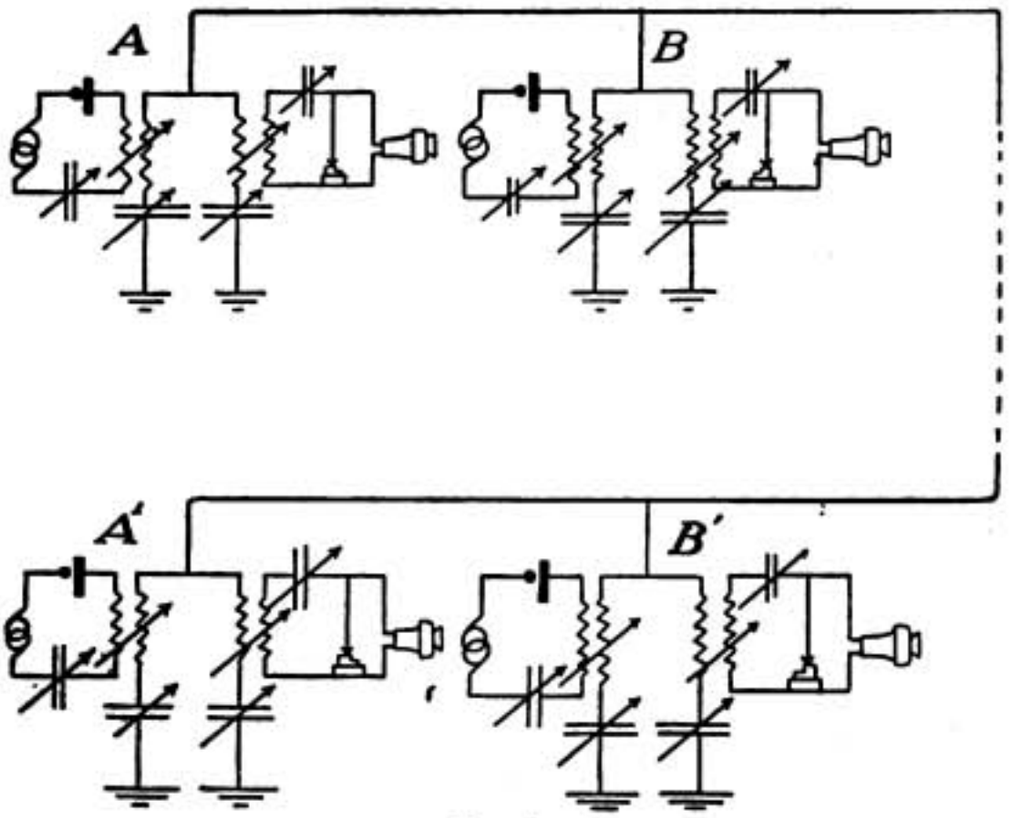


Fig. 2.

THE MULTIPLEX SYSTEM.

[Having thus outlined the fundamental ideas of the method in the simplest form, Mr. Stone goes on to describe its application to a pair of duplex stations for two-way transmission for each station, which he illustrates by Fig. 2, and then proceeds to the "more complex, but more perfect" multiplex shown in Fig. 3.]

In Fig. 3 the receiver circuit is shown alone, and it is to be noted that in the branch from the line wire there are two loop circuits, 1 and 2, each consisting simply of a condenser and a coil. These loop circuits are each made resonant *per se* to one of two frequencies, currents of which frequencies it is particularly desired to exclude from the receiver. Thus, if this receiver were to be used at stations A or B of Fig. 2, its loop circuits 1 and 2 would be individually made resonant each to one of the two frequencies generated by the transmitters of stations A and B; while if it were used at one of the stations A′ or B′, its loop circuits would individually be made resonant each to one of the two frequencies generated at the transmitters of stations A′ and B′. The effect of the presence of one of these looped resonant circuits in the receiver branch is practically to make the branch electrically opaque to currents of the frequency to which the loop is made resonant.

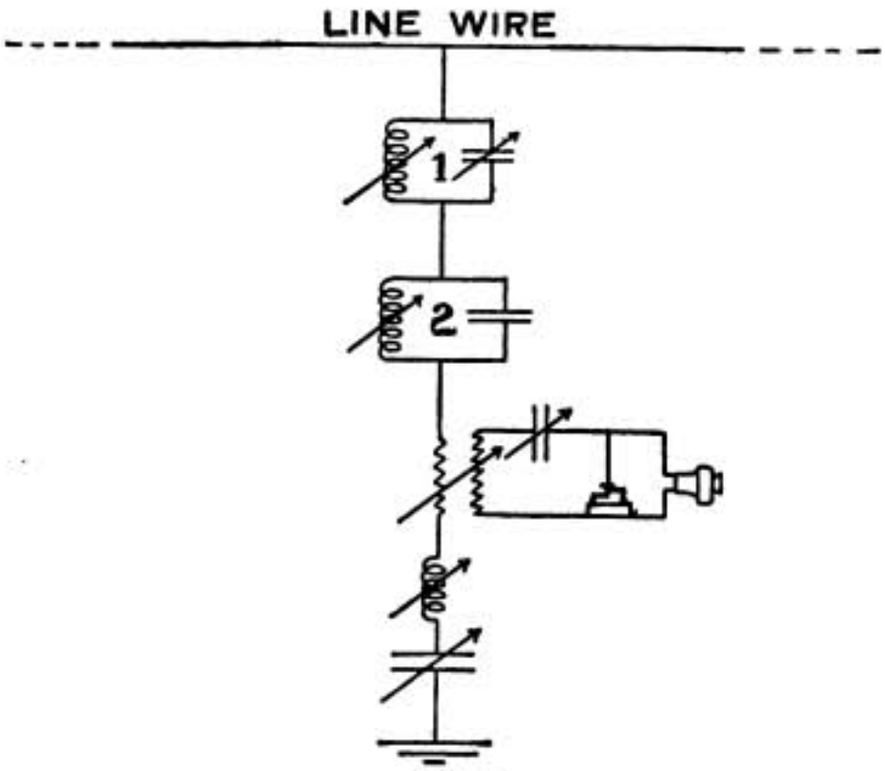


Fig. 3.

RECORDING OF SIGNALS AT THE TRANSMITTING STATION.—It has for some time been recognised that a record of all signals sent out from a station should assist in the smooth working of traffic; for such a record, if taken in the right manner, would not only show at once if the transmitting apparatus were working properly or if its action could be improved by some adjustment, but also it would decide, in the case of an error in transmission, whether this was the fault of the transmitting operator or of the receiving operator. In order to perform these functions, the record should be taken from the signals actually leaving the aerial, and not from any earlier source, such as the current from the manipulating key. Various methods have been tried with more or less success; the aerial current has been made to induce a spark in a subsidiary circuit, and the spark made to record, either by puncturing or by chemical action, on a moving strip of paper. In another method, a small fraction of the aerial current has been rectified in some manner and made to work a recorder.

But certainly one of the simplest methods, and a very successful one, is that recently introduced by the Marconi Company at some of their stations. A circuit comprising an ordinary Morse inker and a suitable battery is interrupted by a very short spark-gap with large sparking surfaces. The air-gap naturally behaves as a complete break in the circuit under ordinary conditions. When, however, signals are being sent out from the aerial, these are made to produce a spark across the gap, which breaks down the insulating properties of the gap and allows the battery to force a current through the inker so long as the signals last. In this way the signals sent out from the aerial leave a complete record on the Morse tape.

The Use of a Condenser as a Shunt to a Telephone

By H. SMITH, B.Sc.

The author examines the conditions under which the telephone receiver is employed in wireless telegraphy in order to determine the most advantageous relations between the constants of the various parts of the circuit.

IN practically all systems of wireless telegraphy the telephone receiver has superseded all other forms of reception, and it is, therefore, a matter of importance to examine the conditions under which the telephone is employed in order to determine the most advantageous relations between the constants of the various parts of the circuit. This is considered in a paper which appears in the Proceedings of the University of Durham Physical Society.

It has been found for the telephones used in practice that the best results are obtained when the telephone is shunted with a capacity. The best value of the capacity depends, among other things, on the telephone, and the practical rule has been that the greater the resistance of the telephone the less the value of the capacity to give the loudest sound. It is sometimes stated that the function of the capacity is to form an easy path to the oscillations past the telephone whose inductance when introduced into the oscillating circuit would otherwise seriously enfeeble the current strength. That this explanation is insufficient is clear from the fact that there is an optimum value of the capacity. It was with the object of affording an explanation of this phenomenon that the following work was undertaken.

Fig. 1 shows a very usual method for coupling the receiving circuit with the antenna. The adjustable condenser C_1, made use of only under certain circumstances, allows of tuning in the receiving circuit, and is generally very much smaller than the block condenser, C, used as shunt to the telephone, T. If C is increased while the messages are being received, the intensity in the telephone increases at first, followed by a deadening and lowering of the note, due, one might imagine, to the suppression of the higher harmonics. As the condenser, C, and the inductance of the telephone form an oscillatory circuit, it is reasonable to expect resonance with some

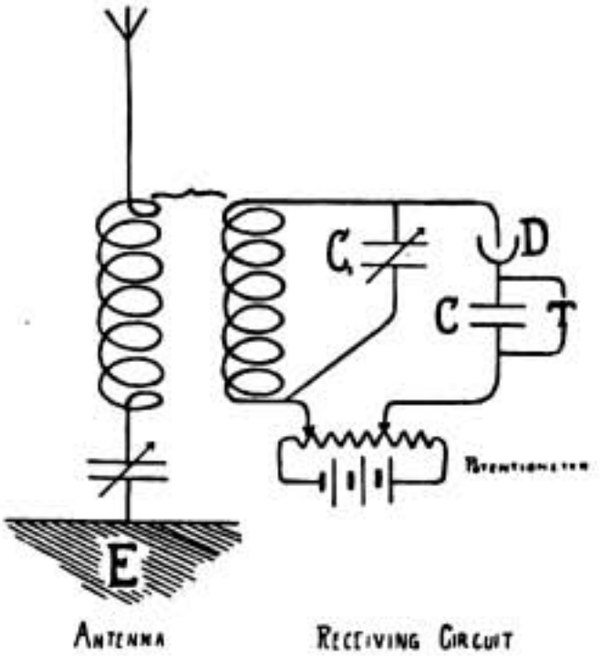


Fig. 1

of the harmonics. If this be so, the best value of the capacity, C, will be when the telephone circuit is in resonance with the more pronounced of these harmonics. Moreover, the addition of an inductionless resistance, if of sufficient value, to the telephone circuit should effectually prevent all resonance, and no rise in intensity in the telephone would be observed.

Experimenting with the arrangement shown in Fig. 2, I have found this actually to be the case; indeed, with one telephone tested, whose resistance was large compared with its inductance (2,000 ohms and 0·02 henry respectively), there was a continuous falling-off in intensity from the moment condenser C was put across it without any further addition of resistance.

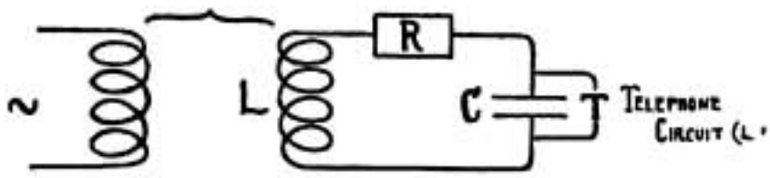


Fig. 2

The current through the telephone is, of course, intermittent, occurring every time the detector, D is traversed by oscillations picked up from the antenna. We may, however, regard it as an alternating current whose frequency is that of the break in the primary current at the sending station, and which has superposed on it a direct current, and contains in it also a large number of harmonics.

The following arrangement was adopted as sufficiently well reproducing the condition of things in the receiving circuit: L represents the inductance of the receiving circuit. The seat of the E.M.F., as before, is the circuit LC, but is produced by coupling with an alternating current instead of being taken from a potentiometer.

With such an arrangement as this the current due to any particular harmonic through the telephone is a maximum when

$$C = \frac{L}{R^2 + \omega^2 L^2} + \frac{L}{R_1^2 + \omega^2 L_1^2}$$

where L and R are the inductance and resistance of the coupling circuit LC, L_1 and R_1 the inductance and resistance of telephone circuit, consisting of the telephone and the condenser, C, and $\omega = 2\pi X$ frequency of the harmonic.

When R_1 is very large and R small, very beautiful resonance in the coupling circuit, with the harmonics in the alternating supply, is obtained. The intensity of the sound in the telephone is a series of maxima, each maximum giving a different note, whose frequency is the same as the harmonic. In the case of wireless telegraphy, the resistance R is in general greatly due to the detector, and from the symmetry of the expression given for the value of C, if R_1 were small this time, we should expect to have the same phenomena in the telephone. R_1, however, is not small, and, instead of hearing several notes at different maxima, the intensity rises to one maximum only, not very sharply defined.

With three different telephones the following results were obtained:

TABLE I.

Telephone's Resistance.	Telephone's Inductance.	Value of Capacity to Produce Maximum.	Frequency of Telephone Circuit.
Ohms.	Millihenries	Microfarads	
3·75	4	4·5	1,190
130	48	0·3	1,340
157	100	0·2	1,130

We see from this that when the maximum occurs the frequency of the telephone circuit is very approximately the same for very different telephones. No very good agreement can be expected, as not only is the inductance of a telephone difficult to measure accurately, owing to its resistance, but the optimum value of the capacity is not very easy to note. The constants of the coupling circuit, LC, were L=158 millihenries and R=4,000 ohms.

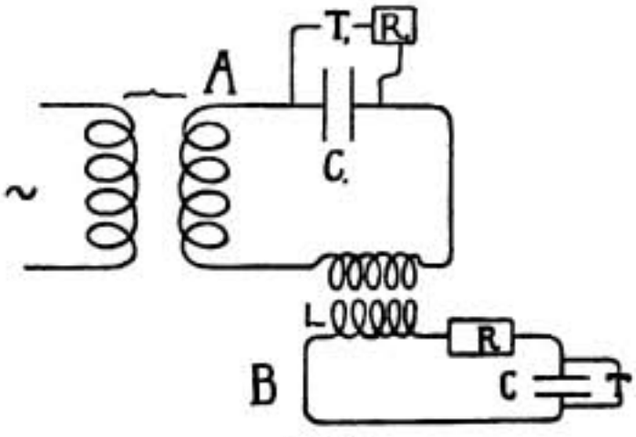


Fig. 3

To study better the effects of resonance in the telephone circuit, the following arrangement was adopted:

Circuit A is brought into resonance with

any desired harmonic by varying C_1 and listening in the telephone T_1 (R_1 must be large—say, 10,000 ohms) till the corresponding note is a maximum. Circuit B is now coupled with A and C, varied till the harmonic gives a maximum in the telephone T. In this way the following results were obtained:

TABLE II.

Harmonic.	Frequency of Harmonic.	Telephone's Resistance.	Telephone's Inductance.	Value of Capacity to Give Maximum.	Frequency of Telephone Circuit.
			mih.	mfd.	
3rd	240	157	100	1 (appx)	437
15th	1,200	3·75	4	4·5	1,190
—	—	130	48	0·35	1,230
—	—	157	100	0·2	1,130

The discrepancy between the frequency of the harmonic and that of the telephone circuit (calculated by taking into account its resistance which is effective in low frequencies) in the first case is very great. It is due partly to the fact that it was very difficult to decide when the maximum occurred, but chiefly to the existence of the higher harmonics, as the fifth and seventh, which were still quite strong. To separate mentally the effect of each note was impossible.

In the case of the other telephones I was unable to determine the optimum capacity at all, the change in intensity was so imperceptible, but for the small inductance telephone it was certainly greater than 12 microfarads. With the 15th harmonic it was different, as it was very much more powerful than any of its neighbours when separated in the way given above, and fair agreement between its frequency and that of the telephone circuit was obtained.

It would appear, then, that when a telephone is shunted with a condenser, the maximum intensity in the sound which occurs is due to resonance in the telephone circuit with the various harmonics, the maximum being in reality a compromise of several maxima due to several harmonics. In the case worked out above it occurred in the region of the maximum produced by the 15th harmonic, which was a particularly prominent one.

Applying these results to the case of the telephone used as a receiver in wireless telegraphy, we see that the value of the capacity used as a shunt to the telephone, which produces the maximum intensity in the telephone, is not independent of the break in the primary current at the sending station; that in the general case, where circuits in parallel with the telephone have a large resistance, this maximum is due to resonance in the telephone circuit alone; that the "harmonics" in the break, and not the frequency of the break itself, may be the most important factor in determining the value of the capacity to produce the best effect for any one telephone.

THE CALIBRATION OF WAVE-METERS FOR WIRELESS TELEGRAPHY.—The main source of error or uncertainty in the calculation of the frequency of a wave-meter lies in the capacity between neighbouring portions of the coil forming the inductance. With the condenser removed the coil itself has a definite natural frequency, the ends acting as the plates of a condenser, and the central portion as an inductance. Knowing the effective inductance and the natural frequency, the effective or self-capacity of the coil is calculable. Professor G. W. O. Howe, in a paper before the Physical Society, asks in what way the calculation of frequency for a capacity inductance combination must be modified in order to allow for the self-capacity effect of the coil. No attempt is made to give an exact answer to the question, but it is shown that for practical purposes it is sufficient to take the effective inductance as equal to the total inductance and add the self-capacity, calculated from the natural frequency on this assumption, to the capacity of the variable condenser. An experiment was made on the coil having an inductance of 2·16 millihenries, and a natural wave-length, when freely oscillating in space, of 185·5 m. Its terminal capacity was increased by small amounts by means of brass spheres varying distances apart, and the resonant frequency determined in each case. Plotting the square of the wave-length against the added capacity, a straight line is obtained which does not pass through the origin for zero added capacity. The result shows that the effect of self-capacity of the coil is to add a constant capacity of 5·5 micro-mfd. to that of the variable condenser.

SCIENTIFIC NOTES

ATMOSPHERIC DISTURBANCES. — Dr. H. Mosler deals at length, in the *Electrotechnische Zeitschrift*, with the problem of atmospheric disturbances in wireless telegraphy. The investigations were carried out between August, 1911, and July, 1912, and these enabled Dr. Mosler to collect some useful data as to the occurrence of disturbances in different seasons, throughout day and night, and under varied atmospheric conditions. The results are set out in tabular form. On January 25th, 1912, there were no disturbances between the hours of 9 a.m. and 8 p.m. At 9.30 p.m. the disturbances averaged 0·25 per minute, at 11 p.m. 1·5, at 12.15 a.m. (January 26th) 1·7, at 3 a.m. 1.

The following data were collected on July 24th and 25th, 1912:

Time.	Number of Disturbances per Minute.	Weather Conditions.
10.45 a.m.	1	Storm approaching
12.15 p.m.	9	Stormy
12.45 ,,	20	Lead-grey clouds pass over aerial wire
1.20 ,,	20	Sultry
2.00 ,,	27	Clouds increase
2.20 ,,	43	Thunderstorm approaching
2.45 ,,	48	Thunderstorm approaching
4.00 ,,	53	Thunder feebly audible
5.00 ,,	50	Thunderstorm in S. & S.E.
6.00 ,,	47	Thunderstorm in S. & S.E.
7.45 ,,	52	Clouds over antenna
8.00 ,,	52	Clouds over antenna
9.15 ,,	48	Thunderstorm passes in south-westerly direction
11.00 ,,	40	Clearing up over station
11.45 ,,	28	Partly starry, still clearing up
1.00 a.m.	15	Predominantly starry
2.30 ,,	9	Starry
6.30 ,,	4	Cloudless
8.00 ,,	5	Cloudless

The character of the clouds and the temperature of the air were of importance, and it was noticed that the frequency of the disturbances increased as lead-grey storm clouds hovered over the antenna and decreased after those clouds had passed. Dr. Mosler has found that the disturbances caused by lightning discharges have no influence upon receiving stations situated some distance away from the seat of the discharge. Atmospheric disturbances are more frequent in mountainous country which favours the formation of clouds and thus tends to produce greater potential falls than in flat country. Disturbances increased during hail and snow storms in winter, whilst they were relatively infrequent when the sky was overcast or during rain or fog.

* * *

MEASUREMENT OF THE FREQUENCY AND DECREMENT OF COUPLED CIRCUITS.—In a paper read before the Société Française de Physique, C. Tissot refers to the well-known fact that four sets of oscillations exist in a coupled system, due to the reaction of the two circuits on one another. The four oscillations may be divided into two groups of different periods. The inductive effects on the wave-meter are additive for one group and subtractive for the other. In order to measure with some precision the periods and decrements of the oscillations in the whole system, it is desirable to separate the two resonance curves of the two secondary oscillations. This may be done as shown by Zenneck in *Leitfaden. d. drahtlosen Telegraphie.* The author establishes the method mathematically at some length, and then describes a special type of wave-meter due to Pellin. The inductance of this instrument consists of a circular solenoid, which is thus unaffected by any inductive influence from the circuit to be measured. Two coupling loops—necessary for the Zenneck method—are connected to the inductance by flexible wires. The variable condenser plates are of lozenge shape, and slide over one another in such a way that the capacity is a linear function of their relative displacement. The scale of the condenser is directly graduated linearly in wave-lengths. To measure the two wave-lengths in a transmitter the proceeding is the following: One of the coupling loops is brought near the Oudin resonator forming the transmitter, and the condenser varied until maximum reading is indicated. This gives the wave-length λ''—the long wave. The second coupling loop is now brought near the Oudin, the reading now either

increasing or decreasing. The loop is withdrawn until the reading passes through a minimum. The reading can then by suitable arrangement of the first loop be made zero; with the coupling loops then fixed, the procedure to measure λ' is that usually employed. Similar manipulation enables λ'' to be fixed. The method described for obtaining the decrement is to read the current for resonance, and then put the wave-meter out of tune until the current I_0 is reduced to $I_3/\sqrt{(2)}$; then

$$\gamma+\delta=\pi(\lambda''-\lambda')/\lambda_0,$$

where λ_0 is the wave-length for resonance and λ'' and λ' the out-of-tune readings each side of the resonant position; γ is the decrement of the transmitter, and that of the wave-meter. With the type of wave-meter described the difference $(\lambda''-\lambda')$ and λ_0 are read directly. By using an arc instead of a spark in the exciting circuit, the decrement of the wave-meter is at once obtained from the equation above.

* * *

RESONANCE IN WIRELESS TELEGRAPHY.—In a paper of such interest that we await a sequel on the same lines, Dr. W. H. Eccles first sketches, in the *Electrician*, the various steps which have been taken from time to time in the direction of exalted resonance in wireless work, and then goes on to a mathematical comparison of the different kinds of waves produced by the various methods adopted, in so far as they are involved in one particular part of the process of transmission and reception. The particular part in question is the transfer of energy from the transmitting aerial to the receiving aerial, and Dr. Eccles deals with the question by calculating what he calls the "efficiency of transmission" for the various kinds of wave-trains; that is, the ratio of the energy picked up by the receiving aerial to the energy radiated by the transmitting aerial.

He deals first with the original Marconi aerial with the spark-gap in series—the "plain aerial" of early days, whose characteristics he sums up tersely by saying that it "possessed radiating powers so far in excess of its capability of storing energy that the train of waves emitted by it was comparatively short."

This aerial, together with the Lodge arrangement with its large elevated capacities, he shows to have the percentage efficiency represented approximately by

$$100b/(b+m)$$

where b is the co-efficient of decay of the receiving aerial, and where m is the co-efficient of decay of the transmitting aerial. This percentage represents the percentage of the *ideal* efficiency which would be given by entirely undamped waves *of pure sine-shape.*

In the case of the "plain aerial," m was probably much larger than b, and might be put as equal to $3b$, giving a percentage value of 25 per cent.

The Lodge conical capacity areas, having greater storing capacity and less radiating power, would probably give a value of m about equal to b, so that their efficiency might be 50 per cent.

Dr. Eccles proceeds to point out that the loose-coupled sender using ordinary sparks may, so far as this investigation is concerned, be considered along with the "quenched spark" and the Marconi disc spark, and shows that its efficiency may be represented approximately by the percentage

$$\frac{100b\,(b+m+n)}{(b+m)\,(b+n)}$$

b having its former meaning, and m and n being the co-efficients of decay of the two waves emitted by the transmitting aerial.

Then, taking two actual examples of spark-stations, he shows that the values of m (=·02) and n (=·2) found at one of these stations give an efficiency of 90 per cent., and at the other station the values (·05 and ·1 respectively) give an efficiency of 92 per cent. And this is so even when a decrement so low as ·05 per half-period has been assumed at the receiving aerial, so as to favour the continuous wave method as much as possible.

The conclusion, therefore, arrived at is that so far, at any rate, as this part of the process is concerned, the Spark Systems have already arrived so near to the ideal efficiency of 100 per cent. (which could only be attained by perfectly continuous waves of perfect sine-shape) that a generator of continuous waves would have to have high efficiency "inside the station" in order to prove more economical.

Signalling throughout the Ages

From Æschylus to Marconi

NEARLY every train that comes into Charing Cross waits a considerable time on the bridge outside before entering the station. No doubt this is very annoying to the vexed soul who thinks he can't afford to waste a minute, but to the passenger who is not above indulging in a day-dream this is an opportunity not to be missed. Before him is spread out the whole splendid sweep of the Embankment, showing white against the shifting foliage of the plane trees and crowned with serried ranks of twentieth-century palaces. Aladdin palaces they are too, erected some to Business, some to Pleasure, but all as magnificent as each other. To the left the Houses of Parliament, and more particularly the beautiful St. Margaret's Tower, command the view, while to the right the eye catches the masts and aerials of the wireless installation over Marconi House silhouetted sharply against the sky. Here, then, is the allegory. Before you, towering over the murky Thames, is the splendid embodiment of Imperial power. This Gothic magnificence is the shrine of our national life, alone supplying the motive force for the nations—nay, more than that, for the world's progress. Within, the keenest intellects of the Empire take counsel together. Together they watch the ebb and flow of human affairs. Before them are placed the manifold needs of the times, and it is for them to solve the bewildering tangle of political and social economy. As a matter of fact, these, the nation's representatives, are alone in a position to attempt such a task, for it is their unique privilege to hold in their hands the myriad threads of government. Like skilful weavers, they weave these multiple interests into an ordered pattern, their whole aim being to produce unity of purpose—that most important factor in all government, and the only power likely to have any permanent effect on the progress of the nation.

But if the Houses of Parliament represent the Lawgiver, the Marconi installation represents the Prophet. It is the forerunner of twentieth-century science, opening up a new horizon of knowledge and a new vista to mankind. It has a prophetic, a still small voice :

> Which whispers in its song
> Where hast thou stayed so long ?

"I," it urges, "I am the great electric force of Nature. Age after age my power has lain latent, and men have passed it by unheeding. Now that power is manifest, but its capabilities not yet fully fathomed. It is for you, the people of the New Age, to conquer new worlds, worlds as yet undreamt of by man. Advance, be tireless, learn, strive, wrestle with secretive Nature, and it may be that I shall some day be your swift, silent messenger over the great wilderness of . . . "

But Pegasus must be bridled, and we must not allow our day-dreams to leap too far beyond the matter-of-fact. Nevertheless, whatever may be the opinion of the merely matter-of-fact, the slender Marconi masts and almost invisible wires do typify a new power : power over the elements and forces of Nature whereby one of its most elusive entities has at last been yoked to the service of man. This also is progress, but progress in the natural world, as contrasted with the world of human affairs ; and if the Houses of Parliament stand as a symbol for human advancement, so also does a wireless installation mark an epoch as bringing another factor into the complex system of the universe.

But talking of progress throws the

thoughts back to a more primitive existence, and as the subject of wireless has been brought to our notice, let us imagine the world when the present means of communicating through space was wanting. What a darkness, what a narrowing of outlook, creeps over the intelligence! What loneliness must have encompassed the savage, who could only communicate with those in his immediate presence! Life must have been full of the terrors of unknown quantities for him, all of which were enhanced by the powerlessness to combine with his fellows in subjugating the overwhelming forces of Nature.

Aes triplex, again, must have fortified the hearts of the early mariners who put out to sea knowing that if danger overtook them they would appeal for help in vain, as there was no messenger who could carry their cry of distress to their unsuspecting fellows on shore. Think, too, what it meant to travel from city to city. As soon as your comrades were out of sight you were alone, travelling in a new world, surrounded with enemies, and with nothing but your personal force to protect you from a thousand foes.

Necessity, however, is the mother of invention, and no doubt it was the ever-present menace to life which compelled man to devise some process of signalling. Naturally fire would commend itself as an expedient for such a purpose, and so we find it in use amongst the primitive civilisations, and more especially the Greeks.

We call to mind a passage in the "Agamemnon" of Æschylus in which such an episode occurs. It opens the play. The watchman is standing on the Towers of Argos:

> Watching for the torch,
> The appointed flame that wings a voice from Troy,
> Telling of Capture.

Suddenly the flame grows bright, and news is sent to Clytemnestra that the weary siege is over and Troy has fallen. The news spreads through the city, and the chorus:

> Old Troy is taken? how?—when did it fall?

Looking east from Charing Cross, this view shows the wide sweep of the Embankment. To the right of the large building on the left can be distinguished the aerials on the roof of Marconi House.

And Clytemnestra replies:

The self-same night that mothers this to-day.

While to the question

But how? what stalwart herald ran so fleetly?

she answers:

Hephæstus. He from Ida shot the spark;
And flaming straightway leapt the courier fire
From height to height; then the Hermæan rock
Of Lemnos, first from Ida; from the isle
The Athoan steep of mighty Jove received
The beaming beacon; thence the forward strength
Of the far-travelling lamp strove gallantly
Athwart the broad sea's back. The flaming pine
Rayed out a golden glory like the sun,
And winged the message to Macistus' watch-tower.
There the wise watchman, guiltless of delay,
Lent to the sleepless courier further speed;
And the Messapian station hailed the torch
Far-beaming o'er the floods of the Euripus.
There the grey heath lit the responsive fire,
Speeding the portioned message; waxing strong,
And nothing dulled across Asopus' plain
The flame swift darted like the twinkling moon,
And on Cithæron's rocky heights awaked,
A new receiver of the wandering light.
The far-sent ray, by the faithful watch not spurned,
With bright addition journeying, bounded o'er
Gorgopus' lake and Ægiplanctus' mount,
Weaving the chain unbroken. Hence it spread
Not scant in strength, a mighty beard of flame,
Flaring across the headlands that look down
On the Saronic gulf. Speeding its march,
It reached the neighbour-station of our city,
Arachne's rocky steep; and thence the halls
Of the Atridæ recognised the signal,
Light not unfathered by Ida an fire.
Such the bright train of my torch-bearing heralds,
Each from the other fired with happy news,
And last and first was victor in the race.
Such the fair tidings that my lord hath sent,
A sign that Troy hath fallen.

But fire was not the only means of signalling which the Greeks employed. They had a system of heliography, employing their burnished shields much in the same way as the heliograph flashes a message to-day—or perhaps it would be wisest, considering the use now made of wireless telegraphy in the Army, to say yesterday. This, you see, was a great advance on beacon signalling. But its limitations are obvious. The distance was limited to the range of human sight, and it was only when the telescope was invented that the distance could be materially increased. Another invention which afforded a new means of signalling was that of gunpowder. Its discovery may be safely ascribed to the fourteenth century, though its use for signalling was not recognised till much later. In fact, one of its earliest mentions in this connection is in the instructions issued by Dom Martin de Padella to his fleet in 1597. From this time onward to the invention of the telegraph, a period of several centuries, was unmarked by any striking development. Systems were improved and codification elaborated, but as yet there was no Morse code and no telegraph.

Signalling by means of flags was, of course, largely used, but the most interesting of all message transmission was that employed in the days of Nelson by the British Government. It was the semaphore system, by which messages were signalled without any intervention from Whitehall to the quarter-decks at Portsmouth and Plymouth. The initial station was installed in Whitehall, where wireless has now been erected, and consisted of a simple shutter apparatus raised some height from the ground. At convenient eminences along the road similar contrivances were placed, and these were in use sufficiently late in the nineteenth century for the late Professor Skeat to remember such a semaphore signal on One Tree Hill.

There were fourteen stations in the Admiralty chain between London and Portsmouth, including Whitehall, Chelsea and Putney, within the Metropolis. Eight of the stations did service for the line to Plymouth. Another line of nineteen stations connected Whitehall with Yarmouth, and a fourth, comprising ten stations, ran to Deal. The average distance between two stations was eight miles, but some were as much as fourteen miles apart. Each station was in charge of a naval lieutenant, who had three or four men under him. One man received signals through the telescope, another worked the winch, the third observed the receipt of the signal at the next station, and the fourth entered the record in a journal.

THE OPTICAL TELEGRAPH.

This system of practical telegraph was invented by Claude Chappe in 1796.

Chappe, who was born at Brûlon in Sarthe in 1763, managed to produce this

system of optical telegraph at a very opportune moment, for France was then in the throes of revolution, with powerful enemies menacing her at every side. Frenchmen were quick to recognise the advantages of the arrangement, and when Chappe brought his invention before the notice of the National Assembly it was immediately adopted by the French Government, and Chappe himself appointed *Ingénieur-Télégraphe*. Unfortunately the invention brought little peace of mind to the inventor, for the malicious criticisms of envious rivals and their endeavours to throw doubt on his claims to be the originator of the system caused him such profound depression that he committed suicide in 1805.

It was from France that the semaphore was introduced into England, Lord George Murray, afterwards Bishop of St. David's, being responsible for its adoption here, and for a time managing the new telegraphs at various ports and on Wimbledon Common.

For nearly fifty years on the roof of the Admiralty this quaint telegraph station could be seen. It consisted of a wooden structure, from which a large telescope protruded, while above was hung a series of six movable shutters. It was one of the sights which Londoners pointed out to the wondering admiration of their country cousins, and it was considered by Leigh Hunt worthy of mention in his writings, for in the pages relating to the execution of Charles I. he remarked that on the roof, whence Archbishop Usher viewed the royal tragedy, " telegraphs now apply their dumb and far-seen discourses like spirits in the guise of mechanism, and tell news of the spread of liberty and knowledge all over the world."

THE MORNING WALK.

The *atra cura* of the system was fog; in fact, the whole arrangement entirely depended on fair weather, for even a rising mist would effectively obscure the signals. It is curious, therefore, to read that " the tranquility of the morning and evening are ascertained to be the most favourable hours for observation," and such a report must surely refer to weather conditions which prevail considerably after sunrise and before sunset on a fine summer day. Think of the autumn mists, the November fogs, and the general murkiness of January, February and March. There can have been little opportunity for using the telegraph in any of these months. The authority who made the foregoing observation is Sir Richard Phillips, and it occurs in his " Morning's Walk from London to Kew."

Sir Richard was a most interesting character of the late eighteenth century. Antiquarian, scientist, classicist—encyclopædist, we might almost say. He belonged to a class of men who were not uncommon in his day, and there was no subject of which he was entirely ignorant, and equally there was no subject of which he was entirely master. Brought up to the trade of a brewer, he quickly tired of this unenlightening occupation, and on his own accord became usher to a school in Cheshire. Afterwards he borrowed capital and opened a hosiery establishment, and later added the trades of stationer, bookseller, and patent medicine vendor to his early venture. He wrote considerably, but it is as author of the foregoing book that he shines in his zenith. He discusses everything that may take his fancy from the fashions of the times to the philosophy of Pythagoras, and naturally he could not pass the semaphore station at the Admiralty without having a good deal to say on the subject, thereby giving us some of the most interesting pages in his scrap-book. He tells us that the operators calculated on about 200 days in the year on which signals could be transmitted, while on about 30 more the signals could be worked for a few hours (surely a somewhat optimistic calculation, or times are woefully changed).

Dead flats were found to be generally unfavourable, and stations were useless nearly in the proportion of the miles of dead flat looked over. On the contrary, stations between hill and hill, looking across a valley or series of valleys, were most clear, and water surfaces were found to produce fewer obscure days than land in any situation.

A POLITICAL ECHO.

William Cobbett, the famous editor of *The Political Register* and ardent supporter of Queen Caroline, was a man of similar genius to Phillips, and he hit upon much the same idea for employing his general knowledge. In 1821 he traversed England

on horseback, picking up information which he embodied in articles for his paper. These were afterwards collected and published under the title of "Rural Rides." Here he mentions that the hour of 1 by Greenwich time was transmitted to Portsmouth and back in 45 seconds, the distance being altogether 170 miles; while a similar signal between Liverpool and Holyhead, a distance of 144 miles, is stated to have been frequently sent and answered in half a minute. But this must have been under exceptionally favourable atmospheric conditions, and the message was obviously a simple one. It was a very different matter when an unusual message had to be spelled out or observation was impeded.

Walford, a major in the Essex Militia, who published a book on "Old and New London," puts down the time taken in sending a message from London to Portsmouth on fine days to be about an hour, and this is probably much nearer the mark.

Messages of a stereotyped character were embodied in special short signals, and there is no doubt that these were often sent with wonderful celerity. For example, "Sail to the northward by the first fair wind" was a message for which one signal was provided. Another was an order to execute the sentence of a court-martial: that signal travelled with deadly speed. Special arrangements of the signals indicated the proper destination of the message, whether it was intended for the Port Admiral at Portsmouth or for the Port Admiral at Plymouth, or for the Commander of the Channel Fleet, etc. In all 63 separate signal arrangements were used, and the handymen on tower and hill top knew how to make them talk.

FROM SEMAPHORE TO WIRELESS.

We have a relic of this semaphore system in the signals used on railways. Their simple and effective working, combined with the fact that the messages they have to deliver are of extreme simplicity—merely a matter of "pass" or "stop"—renders them sufficient for their purpose. But when the messages were of varying purport, the method of transmission must have been tedious in the extreme. What a revolution, then, must have been effected by the invention of the electric telegraph! And when on December 31st, 1847, the last manual signal passed between London and Portsmouth, and the telescopes were removed and the quaint wooden structures dismantled, it was verily a new day that had dawned for inter-communication. Man was then communicate with man over vast stretches of country in the least possible time. Even the new system had its drawbacks; it entailed a vast network of wires and cables and elaborate machinery.

But the day of wireless telegraphy was at hand. Already Faraday, Clerk Maxwell and Hertz had prepared the way by their researches for the ultimate development and practical application of their theories by Mr. Marconi, and it was a great day for England when, in 1896, he took out his first patent for wireless telegraphy, and introduced his apparatus to the Government.

The splendour of such an achievement cannot be overestimated. It was a flash of genius—and more than genius—that took the very forces of the invisible and used them as man's second speech. It is the simplicity of the scheme which makes it the more magnificent, and brings it nearer to the sublime, for Nature is always simple in her workings, though the effects may be complex. This is a doctrine which cannot be overlooked. On it will be based the ideal state, the Eutopia towards which all enthusiasm looks forward. As the world advances, so its organisation will become simpler, so the complexities will be lessened, or rather what now appear complexities will be welded together, and things at present diverse will be found to be the counterpart one of the other, fitting into the scheme of the universe as the threads in the weaver's loom.

Every day invention and research, and the less recognised branches of knowledge—philosophy and art—are advancing this annealing process, and every effort in this direction deserves the encouragement of all mankind. Therefore it is worth while to wait a moment, even if it be in a train on Charing Cross bridge, and remember the splendid work being carried on in our "Palace of Westminster"; then, not forgetting the discoveries and inventions that have made that work possible—and of these wireless telegraphy is not the least—let us be thankful for the age we live in.

A Few Marconi Reminiscences

Interesting Early Experiments

By A. E. HANSCOMB

IT was in the spring of 1898, towards the end of February, that I first met Mr. Marconi. He had been conducting his earliest experiments from the cliffs at Totland Bay to a small steamboat, the *Lymington*, if I remember rightly, anchored a short distance from the shore, and at the time named he had established himself in a villa on the south cliff at Bournemouth, quite close to the pier. From here he was sending to and receiving messages from the Isle of Wight, thirteen miles distant on the east, and Swanage, with the Purbeck Hills intervening, eight miles distant, across the bay, on the west. "Adversity makes strange bedfellows," and so it was that a public misfortune brought us together. Mr. Gladstone, shortly before his death, spent nearly a month in Bournemouth. On the day of his arrival a heavy snowstorm visited the Evergreen Valley, and all the wires—telegraph and telephone—were "down," so that our Press telegrams announcing the arrival of the great statesman had to be sent by train to Southampton to be dispatched thence to London.

AN EARLY TRIUMPH.

On the morning following Mr. Gladstone's arrival I paid Mr. Marconi a visit at the little room which he occupied near the pier, and informed him that Bournemouth, for the first time in its history, was practically isolated from the outside world as far as any "wires" were concerned. I remarked: "This is where you come in, I suppose?" He smiled, and modestly replied: "We'll see what we can do." He then retired behind a screen, and I heard a few moments' "clicking" on his transmitter. He was inquiring of his assistant in the Isle of Wight what sort of weather they were having at Totland Bay. In a few moments he handed me a reply message, stating that the weather was "cold but fine." At the same time he remarked: "I am glad to have been able to demonstrate in so unexpected a manner the superiority of my form of telegraphy. You see, I am independent of fog and snow or any of the other elements which go to make the English weather." It was indeed one of the first illustrations of the triumph of "wireless" in its early stages.

It was fifteen years afterwards, in February, 1913, that I next met Mr. Marconi. It was in the corridor of the House of Commons on a Marconi Committee day. The enthusiastic, unknown, modest young man had become an outstanding figure of world-wide fame—a man who had girdled the earth with his "system," and had given his name to a scheme of communication calculated to revolutionise the world's affairs.

When visiting the Lizard district some years ago I was conversing with the lighthouse keeper, who told me of a remarkable instance, even in those early days, of the usefulness of the wireless system. He had received a message, through the adjacent Lloyd's station, from a fog-bound ship some distance out to sea, stating that the captain believed himself to be in the neighbourhood of the Lizard, and asking that if the message was "received" the powerful foghorns might be "blown." The request was complied with, and shortly afterwards a big German liner was seen making its way shorewards, and thereafter proceeded up Channel. The captain, on arrival at Southampton, acknowledged the kindly response to his "wireless" by a letter to the lighthouse keeper. He explained that he had been running in a fog for nearly two days, and that the wireless installation had probably saved him from disaster—at any rate, it enabled him to complete his voyage in safety and good time.

Some amusing personal reminiscences come to my mind as I write. I was on one occasion visiting on holiday a certain Cornish coast resort, and strolled out on a summer's evening to a wireless station. There were two men in charge. With instinctive journalistic curiosity, I was asking as to the height of the "pole" and other innocent questions of one of the men, when his companion looked out from behind a screen, and in a peremptory manner said: "Mr. Walker, please don't answer any more questions." I was evidently regarded as a "spy" or some equally dangerous person.

A "VERY SICK" JOKER.

On another occasion, of more recent date, I was one of a number of journalists on a pleasure trip out from Harwich. We were sending wireless messages to friends in London from the packet boat. One of the party conceived the brilliant idea of sending his wife a few words saying he was "very sick," but hoped to be home as usual in the evening! He laughed hilariously at his idea. I saw my friend that night in Fleet Street and asked him whether his message reached "home." It did, and he had had a rough time with his better half. He was not laughing. His good soul of a wife on receiving the mysterious message, with no reference to locality, had hastened up to his office in London from the suburbs "fearing the worst," as she said. He got such a "wigging," as he told me afterwards, that he was never likely to indulge again in such a practical joke. In fact, he agreed with his wife that it was a senseless form of amusement.

Much water has flowed under London Bridge since those days; a great deal of progress has been made in wireless telegraphy and its adaptability to modern needs. We have seen how it has annihilated space, how it has saved thousands of lives, how it has tracked criminals, how it has aided commerce and social intercourse, how it has succoured those in distress who "go down to the sea in ships." "Marconigram" has indeed been "adopted" into the English language, and in course of time will doubtless take its place in Walker or Webster or Nuttall with becoming distinction.

IN A STUDIO

PHOTOGRAPHY never yet has produced the speaking likeness. Undoubtedly it will represent for us the features of our friends with some degree of verisimilitude. But that photography can do more than this, even the most enthusiastic photographer, if he honestly takes himself to task and weighs the pros and cons of the case, will hardly be inclined to admit. This accounts, no doubt, for the great popularity of those silver-grey effects which are much in vogue at the present moment, and show the subject of the photograph in a kind of misty twilight. It cannot be said that such photographs make any attempt at portrayal; nevertheless the artistic setting gives that charm to the figure or the landscape, as the case may be, which is much nearer the truth than any actual definition could possibly attain.

There is at least one little oasis in this busy London—15-16 The Railway Approach, E.C.—where the truth of our contention can be amply demonstrated. Here are delightful portraits, sufficient to convince anyone that etching and pencil sketches in portraiture cannot be superseded by photography. Mr. G. B. Black is the artist, and he has inherited his talent from his father, while the walls of his studio are covered with some of the most beautiful examples of the art that it has ever been the lot of the writer to hap on. It is besides quite a gallery of celebrities. But the style of the work is its chief charm. This we can discover by looking at the table on which lies "the stone" bearing Mr. Black's latest work. It is the portrait of Mr. Marconi, which has been taken from the life, and is a triumph of skilled workmanship and artistic perception.

The forceful character of the face is life-like, and the sense of fidelity arresting. Furthermore, the arrangement of the subject is all that can be desired. The head shows up clearly against the shaded background, while the chiaroscuro is treated in masterly fashion. We must congratulate Mr. Black on his happy idea and its still happier realisation of securing this authentic portrait of Mr. Marconi. We feel sure it will make a notable addition to his gallery of notabilities.

The Pleasure Pilgrims

A Story of Several Freaks, and one in Particular

HARRY STENHOUSE had been made aware, by the novels which he read while waiting for briefs, that people sometimes died and left fortunes unexpectedly to worthy and indigent relatives. Such events were, however, so delightful and so proper that he believed them to be confined to the world of fiction. When the identical thing occurred to himself he treated it as a joke, which was none the worse for having a substantial foundation. It seemed really funny that an uncle whom he had never met should have been good enough to go out to the Argentine, speculate successfully in land, and then die with no heirs in the wide world except a young barrister in the Middle Temple.

"I can't even write to thank the old boy," he complained to the friends who congratulated him.

However, the money was serious enough—thirty thousand pounds in securities which he could convert into sovereigns any day he pleased. To tell the truth, he was slightly annoyed with his good fortune. He had planned to make his way by talent alone; he had measured his budding powers against the full-flowered achievements of King's Counsel and judges, and he was confident about his future. Now he knew that briefs would come quickly, and that fees would grow bigger, simply because he had no need of them. He would be a success not because he could rise with his own strength, but because Nunky had made pots of money in Argentine land.

It was a humiliating thought. "If I am not careful," he said to himself, "I shall become a politician or a guinea-pig—or both. I must get right away from everything and think the situation over. Shall I disappear into Labrador, like that fellow in H. G. Wells's story? I think not. He had a wife to make him cosy and listen while he yarned away like a lay bishop. Africa is no good; it is full of cinematographs and lady travellers. Even Tibet is *passé*."

The difficulty which wealth had thrust upon him was eventually solved by the creator and servant of wealth—an advertisement. He read an announcement that the s.s. *Sobrina*, a palatial vessel of 6,600 tons, decorated by Waring & Gillow, and fitted with watertight bulkheads and wireless telegraphy, was about to sail from Southampton on a pleasure pilgrimage round the world.

IN THE BAY.

The cheque which he paid for a stateroom on the bridge deck was the first which gave him a taste of the real joys of spending money.

During the first day out from Southampton very few of the passengers lived up to their expectations of a pleasure pilgrimage. The *Sobrina* persisted in washing herself elephant fashion, by the simple process of taking in water by her nose and spraying herself as far back as her tail. At the same time she rolled as if to show how far she could go without turning turtle. Harry had the spacious bridge deck to himself, and no other amusement than to watch the deck-hands dodging the waves. After an hour or two he found himself yawning and wishing he was back in Pump Court. When night came he was only too glad to join the second officer, the ship's doctor and the first engineer in a game of nap for penny points.

By the following morning, however, the emetic performances of the *Sobrina* had subsided somewhat. Up the various companion-ways sad-eyed men and women crawled, blinking at the sunshine and gazing reproachfully at the troubled sea. Harry watched them unsympathetically.

"They are all rich," he said to himself, "and they deserve it. One touch of nature

makes them thoroughly miserable, and will do them good."

A WORDY ENCOUNTER.

His gallantry was, however, stimulated by the sight of a slim girl supporting a stout lady wrapped in a fur coat. He took the lady's other arm and assisted her to a deck chair which he had placed for himself in the most sheltered corner of the deck.

The lady drew aside the silk scarf in which her face was wrapped, and showed Harry a complexion of mottled green.

"Thank you, sir," she said, and shut her mouth firmly.

"Not at all," said Harry. "If you wait a moment I shall bring another chair for your daughter."

The lady sat up with more energy than Harry thought possible.

"Not at all, sir, if you please. My daughter can look after herself. I am obliged to you, but I wish to make it perfectly clear that I do not want anybody hanging round my daughter."

"I have no intention of hanging round your daughter——" began Harry.

"Perhaps not," snapped the lady.

"In fact," continued Harry, "I give you my word of honour not to hang round your daughter—on one condition. She must give me her word of honour not to hang round me."

He was pleased to note that his remark modified the green of the lady's complexion to a suggestion of pink. He retreated quickly, and enjoyed an additional revenge in sending a steward with another deck chair and Mr. Stenhouse's compliments.

AND A CHANCE ONE.

During the day he certainly obeyed the letter of this careful mother's injunction. He did not hang around her daughter. Nevertheless he observed the girl carefully from a distance. And from his study of her graceful carriage, her delicate features, her dark hair and healthy colouring of cheeks and lips, he decided that there might be worse things than to hang round Miss Lynwood while she went round the world. He had some recollection, too, of a twinkle in her eye during his conversation with her mother.

Mother or no mother, he would take the first opportunity of renewing acquaintance with that twinkle.

The opportunity came an hour or so after dinner, when he was walking rapidly round the deck as a kind of soporific exercise. At the corner of the captain's cabin he collided with Miss Lynwood.

"Oh!" she exclaimed, and stood looking at him.

"The stars are my witnesses," he said, "that I was not hanging round you. They are also my witnesses that you rushed straight at me."

"Luckily they cannot speak."

"I suppose not. Yet there are several females among them—some of them mothers, by all accounts."

"Oh, I really must apologise for mother. She did not mean to be rude, but——"

Harry looked at her solemnly. The light showed her face clearly. He waited for the twinkle. It came as the prelude to a laugh in which he joined with enthusiasm.

"She must be sound asleep by now?" he said questioningly.

"She is," replied Miss Lynwood; "but I do not think that I ought to tell you."

"Of course not, but I am sure you are glad, for your mother's sake."

"Oh, yes. She was very ill. At first she said: 'Nessie, this boat is going to sink.' Later she said: 'Nessie, this boat is never going to sink.' You suffered from some of the after-effects this morning."

"Nessie!" repeated Harry in a whisper, as if memorising the name.

"I gave you that name, not for publication, but as a guarantee of good faith."

"Then I agree not to use it except when we are quite alone."

"Oh," replied Nessie in an altered tone, "I think we are going ahead rather fast!"

"This is a fast boat," retorted Harry. "Besides, life is short, and the art of being young and happy is long. 'Gather ye rosebuds,' and so on."

"I see that I shall have to be very stern with you," remarked Nessie.

"I bow to your decision," responded Harry solemnly.

Then they continued their promenades, but not in the contra-flow fashion. Harry took the opportunity of giving her what he called a special edition, for young ladies, of the story of his life.

PRESSING THE ATTACK.

Next morning he made a direct attack on Mrs. Lynwood, who was looking ten years younger than she had done on the previous day—so young, in fact, that he wondered whether jealousy had anything to do with her objection to "hanging round."

"I would like you to understand," he said to her, "that the *Sobrina* is about 500 feet long and 50 feet wide. Therefore it is 500 to 50 that your daughter and I will meet accidentally several times a day. When that happens it would be rude of me to pass by as if we were not going round the world together. I am bound to ask her how she is, and talk about the weather, and how much one eats on board ship, and what a wonderful thing wireless telegraphy is, and all that."

"You are a very impertinent young man."

"I am a very determined one. And now that we understand each other, I may tell you that if the worse comes to the worst, I am comfortably rich, thoroughly sound in constitution, of irreproachable descent, and quite capable of getting a title or an under-secretaryship, or anything you think necessary."

"Well!" exclaimed Mrs. Lynwood. Then she paused in a search for words which would be at once adequate and ladylike.

"'All's well' is the nautical phrase," remarked Harry.

Nevertheless he had a very anxious time during the next day or two. Miss Lynwood seemed to have a magnetic influence on every male creature from the captain to the Marconi operator. Those who were on the right side of thirty were frozen off by Mrs. Lynwood, and those on the wrong side were daunted by being adopted by Mrs. Lynwood as her own squires. During the day which was spent ashore at Havre there was nearly civil war over deciding who was to attend Miss Lynwood (and was *not* to attend Mrs. Lynwood) on the excursions to the lighthouse and to Trouville. Similar struggles continued until the *Sobrina* reached Vigo, when an entirely new phase was brought about by the arrival of Mr. John James Sullivan.

He had come on board during the night. Rumour said that he owned several ironstone mines in Spain, and was taking his first holiday from business. He was a large man, with a roving eye and a smooth, confidential voice. After having spent a few hours in surveying the pilgrims, he fastened himself upon Mrs. Lynwood.

Obviously she liked the process. And obviously Miss Lynwood did not. She was pointedly rude to Mr. Sullivan—rude, that is to say, with the arctic politeness which only young women can assume with perfect grace and effect. The performance amused Harry, until he noted that Nessie clung to her mother while Mr. Sullivan was "hanging round"—which was generally always. This *partie carrée* ought to have been quite convenient and jolly, but as Mr. Sullivan and Mrs. Lynwood did most of the talking, while Nessie sat silent and watchful, Harry began to realise that he was becalmed in the doldrums.

SCIENCE AND MARRIAGE.

He betook himself to the Marconi cabin to think the situation over. The operator was a sapient young man, who answered readily to the name of Tommy.

"Now, Tommy," said Harry, "you have been twice across the Atlantic, and have had a lot of experience of affairs. What would you do if you could not get any reply to your signals from a young lady because she was too busy chaperoning her mother?"

"Have you tried the S O S signal?" Tommy asked.

"Oh, yes. But apparently she knows neither Morse nor remorse."

"Then you must get the mother married and settled," replied Tommy.

"You are a bright boy," commented Harry. "I wish you would marry her yourself."

"Personally," responded Tommy, "I do not think that men of science ought to marry. At any rate, I shall hardly have time for it. In another ten years Marconi and all those chaps will be thinking of retiring, and there will be a chance for fellows like me, who have been swatting up Fleming's books and thinking things over. I have my own theory about the ether."

"Well, don't divulge it prematurely."

"Trust me for that. But the ether is a queer thing, I tell you."

"So is woman, according to all accounts, though Sullivan tells me that they are as simple as cheese."

Tommy's suggestion led Harry to a con-

fidential talk with Nessie. He met her one afternoon when both Mrs. Lynwood and Mr. Sullivan were enjoying the siesta to which the warmth of Mediterranean latitudes inclined them.

"How do you do, Miss Lynwood? I hope you have been keeping well since I saw you last."

"That was lunch-time."

"No, it was the evening we dropped anchor in Vigo Bay. Since then I have only caught far-away glimpses of you behind Mr. Sullivan's back."

Nessie was silent and thoughtful.

"Do you know," he pursued, "I have come to the conclusion that the world will never be right until your mother is married?"

"Don't talk nonsense, Mr. Stenhouse!"

"Why not?"

"Because it is cruel nonsense you are talking."

"I am sorry, genuinely sorry. But perhaps I do feel a little bitter on the subject. We were getting on famously until this suave Irishman dropped on us from the iron mines of Spain. You look troubled, Miss Lynwood."

"I am troubled, Mr. Stenhouse."

"Then let us sit down and talk it over. I can be just as sensible as anybody over a thing of this kind, if I choose."

"Can you really?"

"Try me, and see."

They sat down together under the shade of the awning.

DEAR MOTHER.

"Mother is a dear——" began Nessie.

"I am not so sure of that," protested Harry.

"Yes, she is; but she is stuffed full of the quaintest notions, and she is as simple as a child. She does not want me to get married, because it will make her seem like a dowager with no chances on her own account. She has an idea that it is a confession of failure and of old age for any woman to be a widow more than twelve months. For the last two years she has had several narrow escapes from the most impossible husbands. Oh, I never thought I could speak to anyone about such a subject!"

"Of course you did not. And you never thought you would pay me such a compliment. So that is why you give Mr. Sullivan the frozen face?"

"Oh—Mr. Sullivan! I hate him!"

"Not more than I do."

"Yes, I do. The man is a fiend. Mother is absolutely silly over his charming manners and his delightful conversation. But I notice that, although he talks about all sorts of things, and tells most amusing anecdotes, he never by any chance gives you any information about himself or his family or his business. I have asked him questions point blank, but he always evades them."

"You ought to be a lawyer, Miss Lynwood, or a private detective."

"It is no good, Mr. Stenhouse. He is too sly for me. He never lets me catch him alone for a single minute."

"Well, this is where I come in. I promise you that before we reach Colombo I will find out about Mr. Sullivan."

"Colombo! That is a long way."

"Yes, but Sullivan is a long proposition. Besides, there is a condition attached to my promise."

"Then I refuse to consider it."

"But you must consider it. It is just that you stop giving the frozen face to me as well as to Mr. Sullivan. I am getting tired of it. Any time within the last week I have been ready to leave the boat. You do not seem to understand that I have made a careful survey of this vessel, and there is not a sympathetic soul in it besides yourself and Tommy the Marconi operator. And even he relapses into incomprehensible talk of jiggers, and damped oscillations, and spark-gaps, and all that sort of thing."

"It sounds interesting."

"Not nearly so interesting as the tip of your nose," replied Harry.

A CHANCE DISCOVERY.

His condition was not formally accepted, but it was conceded in fact. Harry joined Nessie in the cross-examination of Mr. Sullivan, but the witness seemed to detect their motive. He became more genially vague than ever. The *Sobrina* had completed her tour of the Mediterranean, traversed the Suez Canal, and entered the Red Sea before Harry had found out a single fact about Mr. Sullivan.

Even then it was merely the discovery that the man had once worn a beard.

At the end of a day when Mrs. Lynwood had been *hors de combat* under the tropical heat, Harry had managed to inveigle Mr. Sullivan into the smoke-room for a game of poker. During the game, when Mr. Sullivan had been intent on a particularly keen piece of bluff, Harry noticed him raise his hand to stroke an imaginary beard. His expression changed for a moment when he discovered that there was nothing there to stroke.

The man was plainly disconcerted, and looked keenly at his companions to see if they had noticed his action. They all appeared, however, to be intent upon their cards. Mr. Sullivan drew a long breath and rubbed his chin ostentatiously.

As soon as the game was finished Harry slipped away to interview Tommy in the Marconi cabin. The result of the interview was that Tommy despatched a message to Jack Soames, one of London's cleverest solicitors, "yet," as Harry himself said, "one of the few who have given me briefs." The message inquired whether anything was known of a man Sullivan (minutely described in police fashion) who had once worn a beard.

Eventually the reply was received—the reply which Harry had generously prepaid. It was very short and to the point: "*Do not be an ass.*"

SULLIVAN RIPENS.

Harry had confided the beard mystery to Nessie, but he had said nothing about his message to Soames. It was too long a shot to be likely to hit, and Soames's answer made him thankful that caution had kept him silent.

Meanwhile Mr. Sullivan was ripening fast as a possible husband for Mrs. Lynwood. She found his manners perfectly charming, and did not perceive that the secret of his success lay in the way that he encouraged her to talk about herself and to confide her thoughts and feelings to him.

Therefore while Mr. Sullivan went ahead, Nessie and Harry were bogged in despair. Harry was particularly doleful as the *Sobrina* neared Ceylon.

"We shall sight land to-morrow morning," he said to her, as they paced the deck together. "It is a sad look-out for my promise."

"I do not think that I shall be very hard on you," replied Nessie. "But our luck may turn any minute. Perhaps we shall catch Sullivan tripping when we and he least expect it."

"Perhaps," echoed Harry dolefully.

However, the *Sobrina* had left Colombo and had gone the best part of the 3,000-mile stretch to Fremantle before their luck turned. The happy event occurred on the King's birthday, which was celebrated on board the *Sobrina* with intense patriotism and a huge consumption of liquor.

Harry had twitted Mr. Sullivan with being a Nationalist leader in disguise. He told him that the general impression on board was that he was going out to Australia to raise a Fenian gang to settle the Irish question in the good old way. For once Mr. Sullivan's suavity was destroyed. He vehemently resented Harry's bantering, and went so far as to swear in Mrs. Lynwood's hearing—at which the lady smiled indulgently.

This was enough for Harry. Before dinner he had a confidential chat with the officers and most of the male passengers, none of whom had the slightest objection to asking Mr. Sullivan to drink the King's health. The ship's doctor was the first to challenge him when the champagne was served out. Mr. Sullivan patriotically stood up and drank half a glass to His Majesty, God bless him! Then the first officer followed, and the chief engineer and several of the passengers in succession.

When dinner was over, and the ladies had retired, Mr. Sullivan was in a mood to treat the situation as a joke. He joined in the laughter raised by each call of "Mr. Sullivan, the King!" and when a speech was hilariously demanded he rose unsteadily to his feet and grinned contentedly.

A FALSE MOVE.

"Gentlemen," he began, "I rise to ask you to drink to the health of His Majesty the King. But before asking you to honour yourselves by observing that almost sacred toast, I would like to take this opportunity of defending myself against the base charges which have been circulated against me. I ask you to observe that I have already drowned these charges in more champagne than I ever drank in my life before.

I am a teetotaller because my stomach bears the same relation to my constitution as Ireland does to England—it is always tending to revolt. But I would like to dissipate the last shadow of Fenianism from my reputation by relating to you an incident which occurred during the visit of the King to Ireland. You are all aware that extra precautions were taken to prevent any untoward accident. But there was one plot of which the police authorities had no knowledge. Information regarding it came to me in the most casual and unexpected way, and though it was at a real and imminent risk of my life, I sought an interview with the Lord Mayor, who was a personal friend of mine. He said to me, after he had heard my story: 'It is impossible for us to thank you openly, but I can assure you, my dear Gandy, that——'"

Here the speaker stopped suddenly. His jaw dropped, and his eyes stared wildly over his audience. He was like a man suddenly sobered by the spectacle of a crime. After an interval of painful silence he tried to speak, but the mumbled words were lost, and he sank back heavily on his seat with his story unfinished.

GANDY? GANDY?

Harry stepped out and searched for Nessie. He found her in a sheltered corner of the bridge deck.

"Miss Lynwood," he said, "I want you to help me. Where have I heard the name Gandy before?"

"How can I possibly tell you that?"

"Have *you* never heard it?"

"Somewhere, and some time, I suppose. But the name, sweet as it is, has no memories. Why?"

"Because it has associations for me—associations of villainy, like the names of Charlie Peace or Brigham Young. Now, let me think. I shall go through the calendar of crime, and get at the right thing by a process of exhaustion. That's scientific."

"But I don't see——"

"You will presently. Now, let's begin at the top. Murder, manslaughter, wounding with intent to do grievous bodily harm, burglary, housebreaking, petty larceny, forgery, blackmail, bigamy——" He jumped up and then sat down again, and gripped her wrists. "Miss Lynwood," he exclaimed, "I've got him—I've got him by the throat! Gandy the bigamist! Gandy, the man who ran away from woman number three and took all her money with him! Gandy, the man that the police have been hunting all Europe for! Was there ever such a lark?"

He told Nessie the whole story of his discovery.

"Oh," she said, "if it were really so——"

"Well, if—if it were, what then?"

He looked closely into her eyes. She smiled back at him. "If it were," she replied, "I should be very pleased."

"I shall expect to be thanked," said Harry, "as I am sure you never thanked a man before."

"How do you know that?"

"Because you have never been engaged to be married."

"Oh!" she murmured, and remained silent for a while. When she spoke again it was in a very business-like voice.

"You had better proceed to expose your villain."

"Oh, no, I shall not. If I were to denounce him in front of your mother, he would counter me with a plausible yarn, and your mother would believe him and abuse me. Nothing but handcuffs will convince your mother."

"Don't be too cruel, Mr. Stenhouse."

"This is a desperate case, Miss Lynwood. We have got to give Mrs. Lynwood a real shock, and you must leave this business to me."

"You are very masterful, Mr. Stenhouse. I can feel your grip on my wrists yet."

"Oh, I am sorry."

Nessie smiled, but she did not say that she also was sorry.

TOMMY AND THE ETHER.

An hour later Harry shut himself in the Marconi cabin with Tommy.

"I want you," he said, "to send another message for me to London."

Tommy gazed at him solemnly. Then he took a chart from a shelf, opened it, and pointed to a spot in the middle of the ocean.

"That is where the *Sobrina* is at the present moment," he said impressively. "She is fitted with a 1½-kilowatt installation, which has a range of 500 miles, and you ask me to send a message to London."

Harry sighed. "I did not think you would ever use the word impossible."

"I did not say it was impossible," Tommy replied.

"Then you must do it."

"I can't do it," declared Tommy, with an air of profundity, "but the ether can, if it chooses. Have you ever heard of freak messages?"

"Mine is a freak message. It reads: '*Gandy the bigamist on board* SOBRINA *under name Sullivan—inform police.*'"

"I don't mean that kind of freak," said Tommy, as if the presence of bigamists were a trifle. "I mean the wireless signal that carries hundreds of miles beyond its legitimate distance. I remarked to you once before that the ether is a queer thing sometimes."

"Well, I hope it is feeling exceptionally queer just now. What are the odds on a freak message going through?"

"Oh, about one in a thousand," replied Tommy, as if he had made the calculation often.

"That is more than the odds on a happy marriage," commented Harry. "Now, fire ahead. I give you a hundred pounds if that message hits the mark."

Tommy waved his hand with a gesture which hinted that money should never be mentioned to young men with theories about the ether. Nevertheless he worked with scientific zeal to make the second message to the unbelieving Soames carry across the thousand or two miles which separated the *Sobrina* from the nearest wireless station.

"OH, DEAR!"

In spite of the commanding air which he assumed with Tommy, and the contented manner he adopted with Nessie, Harry was quite certain that the ether had swallowed up his message. One might as well shoot peas at the moon, he told himself. When he got to Fremantle he would need to take the matter up with the police there, and ten to one Gandy would get wind of his operations and disappear a second time. That would be a victory in a sense, but not the dramatic victory which his soul desired.

He felt little more than the idle curiosity of most of the passengers when the health officer's boat approached the *Sobrina* outside Fremantle. Even the presence of two additional men in the boat did not suggest anything to him.

He stood near the head of the gangway, with Nessie and Mrs. Lynwood and Mr. Sullivan leaning on the rail close to him. One of the men following the health officer spoke a few words to the officer at the head of the gangway; the officer pointed to Mr. Sullivan, and the man stepped forward and touched him on the shoulder.

"Mr. Gandy," he said, "I hold a warrant for your arrest on a charge of bigamy and misappropriation of funds."

Mr. Sullivan spun round and put his hands out; the other man took the opportunity of slipping handcuffs on them.

It was all done so quickly and so quietly that Mrs. Lynwood did not realise what was happening until Mr. Sullivan was being led away. Then she looked at Nessie as a child might look at her mother after an earthquake shock.

"What does it mean?" she whispered

"It means, mother," replied Nessie, "that Mr. Sullivan is a felon."

"Oh, dear!" gasped Mrs. Lynwood, and promptly collapsed on to the deck.

* * * * *

She did not reappear until the *Sobrina* was nearing Melbourne. During that time Harry saw little of Nessie, and he had to console himself with the company of Tommy, who was preposterously proud of the success of his freak message. "It will make the Marconi service green with envy," he said.

Strangely enough, Mrs. Lynwood was very gracious to Harry when they met again, so gracious, in fact, that Harry was allowed many hours alone with Nessie.

"We owe all this to Tommy," he said to her one evening. "You ought to go and kiss him."

"He would not appreciate it."

"Perhaps not. He is too young to think of anything but the ether. But I am not too young, and in another thirty or forty years I shall be too old. It has occurred to me that I ought to begin at once. I am waiting for you to say 'thank you' in the only really satisfactory manner."

And in this case, although a powerful transmitter was close to a sensitive receiver, it was apparently found necessary to repeat the message an indefinite number of times.

ADMINISTRATIVE NOTES

New Italian Station

WE have received particulars regarding the new station at Genoa, Italy, which has been opened in place of that at Cape Mele, recently dismantled. The station is officially known as that of Genova (call letters I C B), and its geographical position is 44° 25′ 44″ north; 8° 56′ 02″ east of Greenwich. It is equipped with Marconi apparatus for a range of 160 miles, and wave-lengths of 300 and 600 metres. The station will be open day and night for general public service, and the coast rate for messages has been fixed at 30 cms. per word.

* * *

Telegraphs in Morocco

REGULATIONS concerning the Spanish Protectorate in Madrid are published in the *Gaceta de Madrid*. These regulations provide that concessions for certain public works, including wireless telegraph installations, will be dealt with by the Delegado de Fomento and then laid before the Governor-General, who will advise thereon. Wireless telegraph, telegraph and telephone services will be subject to the administration of the Jalifa.

* * *

Compulsory Wireless for Canadian Vessels

THE Government Bill respecting the use of wireless telegraphy on Canadian vessels finally passed the Marine Committee on February 14th. The Bill proposes to make it compulsory to have wireless (*a*) on vessels licensed to carry fifty or more people, including crew, plying 200 miles; (*b*) on vessels licensed to carry 250 or more people plying more than 90 miles; and (*c*) on vessels carrying 500 or more and plying more than 20 miles. The apparatus must be capable of transmitting and receiving messages, night and day, over 100 miles, and have a competent operator. Certain amendments were passed while the Bill was before the Committee, the effect of which is to exempt from its operations Northumberland Straits, Bay Quinte (north shore), Georgian Bay, the Toronto and Hamilton Line, and rivers and small lakes.

* * *

Progress of the Canadian Stations

THE last annual report of the Canadian Department of the Naval Service contains the usual section devoted to the operations of the wireless stations round the Canadian coast. The service of these stations has been maintained and operated at the general high standard of efficiency which is shown in the satisfactory increase in the number of words handled for the year ended March, 1912—namely, 2,851,350 words compared with 1,826,895 during the corresponding period of the preceding year. This increase is said by Mr. C. P. Edwards, the general Superintendent of the Government Radiotelegraphs, to be due to the fact that the reliability of the service is becoming more widely known among mercantile houses. Cable interruptions are a source of considerable revenue for the service. Two breaks of importance occurred during the year, one on the United States Government Alaskan cable between Seattle and Alaska, the other on the cable between Prince Edward Island and the main land. In the former case a large number of messages were handled *via* the wireless station at Ketchihan, Alaska, and the Prince Rupert station, and in the latter all the messages to and from Prince Edward Island were handled *via* the stations at Pictou and Cape Bear. This business was handled without difficulty, and the utility of the wireless service thus further demonstrated. There were no breakdowns or interruptions of communication between any of the wireless stations during the year.

CONTRACT NEWS

THE Compagnie de Télégraphie sans Fil, of Brussels, have arranged to equip three cargo steamers of the Nederland Steamship Company with ½-kw. and emergency sets, and two of their passenger steamers with 1½-kw. and emergency sets. The Rotterdamsche Lloyd Company are having a cargo steamer fitted with ½-kw. and emergency set, and are making arrangements to have another of their passenger steamers fitted. The K. Hollandsche Lloyd are to have two more of their passenger steamers, *The Houtman* and *Van Lansberg*, fitted with 1½-kw. and emergency sets, and possibly a further two. The Tug steamer Company of Muhlen are also to have one of their vessels fitted.

Three short-range stations have been erected for the Police Department of Rotterdam. The Chief Office at Parkhaven is now similarly equipped, while two river steamers have had wireless installed recently.

* * *

That the Minister of Railways at Ottawa may be able to keep in close touch with the progress of the work, and be enabled to send supplies or equipment without a long and tedious wait that the return steamer trip necessitates, it has been decided to establish a wireless service between Le Pas and Hudson Bay terminal when the harbour work is started. "Whether the Bay station will be at Fort Churchill or Port Nelson depends upon the choice of the terminal, and no official announcement is as yet forthcoming," states the *Montreal Gazette*.

* * *

It is reported that a scheme will shortly be laid before the Canadian Government for the establishment of a chain of wireless stations from Athabasca Landing up the Mackenzie River to Herschel Island, and thence to Rampart House in the Yukon. The erection of stations at these points, it is felt, would be useful not only in opening up the country and in obtaining scientific data of the far north, but would be of immediate assistance to the Royal North-West Mounted Police, and to the Meteorological Department by bringing it into touch with a vast unknown territory whose prevailing conditions may influence its forecasts.

Orders have been received by the Marconi International Marine Communication Co. to equip or to refit the following vessels

Owner.	Name of Vessel.	Installation.	Remarks.
Messrs. Gellatly, Hankey & Co.	s.s. *Pathan*	½ kw. and emergency set	General trade.
The Royal Mail Steam Packet Co.	s.s. *Andes*	1½ kw. and emergency set	Travelling in South American waters.
" " "	s.s. *Alcantara* ..	"	Travelling between Southampton, New York, and West Indies.
Liverpool and North Wales Steamship Co.	s.s. *La Marguerite* ..	"	Passenger and pleasure boat travelling between Liverpool and North Wales watering-places.
The Leyland Line	s.s. *Ibernian* ..	"	These vessels carry a limited number of passengers, but their transport trade between Liverpool and Boston is very considerable.
" "	s.s. *Atlantian* ..	"	
" "	s.s. *Caledonian* ..	"	
" "	s.s. *Etonian* ..	"	
Messrs. Furness, Withy & Co.	s.s. *Iowa*	"	Engaged in general trade; no fixed destination.
" " "	s.s. *Digby*	"	Engaged in general trade; no fixed destination.
" " "	s.s. *Shenandoah* ..	"	Engaged in general trade; no fixed destination.
" " "	s.s. *Kanawha* ..	"	Engaged in general trade; no fixed destination.
" " "	s.s. *Rappahannock* ..	"	Engaged in general trade; no fixed destination.
The Petroleum Carriers, Ltd.	s.s. *C. A. Canfield* ..	½ kw. and emergency set	Oil steamer.
" " "	s.s. *Norman Bridge*	"	Oil steamer.

The following vessels have been equipped with Marconi Apparatus during the past month.

Owners.	Name of Vessel.	Installation.	Remarks.
Messrs. Gellatly, Hankey & Co.	s.s. *Pathan*	½ kw. and emergency set	General trade.
Messrs. Anglo-American Oil Co.	s.s. *Tonawanda* ..	½ kw. and emergency set	Cargo vessel between Baltimore, Philadelphia, and New York.
Ellerman Line	s.s. *Kabinga* ..	½ kw. and emergency set	Trading vessels engaged principally in Eastern waters.
" "	s.s. *Kalomo* ..	½ kw. and emergency set	
The British India Steam Navigation Co.	s.s. *Nevasa*	1½ kw. and emergency set	Passenger between Calcutta, Rangoon, and the Straits.
" " "	s.s. *Teesta*	"	Passenger between Calcutta, Rangoon, and the Straits.
" " "	s.s. *Taroba*	"	Passenger between Calcutta, Rangoon, and the Straits.
The White Star Dominion Line	s.s. *Welshman* ..	"	Passenger travelling between Avonmouth or Liverpool to Portland, Maine.
" " "	s.s. *Englishman* ..	"	
Messrs. Elder, Dempster & Co.	s.s. *Appam* ..	"	Passenger between Liverpool and Lagos.
Messrs. Lages	s.s. *Itaquera* ..	"	—
" "	s.s. *Itagiba*	"	—
The Nelson Line	s.s. *Highland Pride*	"	Cargo vessels carrying limited number of passengers between London and Buenos Ayres.
" "	s.s. *Highland Warrior*	"	
Ellerman Line (City Line) ..	s.s. *City of Benares*	"	Passenger between England, Bombay, and Karachi.
Tyser Line	s.s. *Marere*	"	These vessels go eastward to Australia and New Zealand, returning through the South Atlantic.
" "	s.s. *Muratai* ..	"	
New York and South American Line	s.s. *Crofton Hall* ..	"	Passenger between United States and South American States.
Leyland Line	s.s. *Georgian* ..	"	Trading between Liverpool and Boston with accommodation for passengers.
" "	s.s. *Iberian*	"	
The Booth Steamship Co. ..	s.s. *Vincent* ..	"	Southampton *via* Portugal to Madeira.
White Star Line for Board of Trade	Ice scout *Scotia* ..	"	Patrolling North Atlantic ice-fields.
Messrs. Howard Smith & Co.	s.s. *Canberra* ..	"	Destined for Australian waters.
Union Steamship Co. of New Zealand	s.s. *Niagara* ..	"	General trading in New Zealand waters.
The P. & O. Steam Navigation Co.	s.s. *Benalla* ..	"	Destination undetermined.
Allan Line	s.s. *Parisian* ..	"	This fine fleet of passenger boats travel between England and North America or the United States. They were amongst the first to be equipped with wireless, and are now being refitted with the latest apparatus.
" "	s.s. *Ionian*	"	
" "	s.s. *Corinthian* ..	"	
" "	s.s. *Victorian* ..	"	
" "	s.s. *Virginian* ..	"	
" "	s.s. *Scotian*	"	
The R.M.S.P. Co.	s.s. *Thames* ..	"	Travelling between Southampton and South America : refitted.
The Nederland Steamship Co.	s.s. *Batjan*	½ kw. and emergency set	Cargo vessels between Holland and the Dutch East Indies.
" " "	s.s. *Boeton*	½ kw. and emergency set	
The K. Paketvaart My. ..	s.s. *Rumphius* ..	1½ kw. and emergency set	Passenger and mail steamers visiting Dutch East Indies.
" " "	s.s. *Hector Treub* ..	1½ kw. and emergency set	
" " "	s.s. *Tasman* ..	1½ kw. and emergency set	
The Rotterdamsche Lloyd Line	s.s. *Murjek* ..	1½ kw. and emergency set	An important line of passenger vessels.
" " "	s.s. *Torne*	1½ kw. and emergency set	
" " "	s.s. *Bandoeng* ..	½ kw. and emergency set	Cargo vessels attached to the same service as the preceding.
" " "	s.s. *Soerakarta* ..	½ kw. and emergency set	
The Trans. Esp. Line	s.s. *Reina Victoria Eugenia*	5 kw. and emergency set	One of the largest Spanish passenger boats.

Maritime Wireless Telegraphy

FOR some time past Trinity House has possessed a regular system of wireless communication between some of the principal Channel lightships and the lighthouses around the South Coast, and navigation has been greatly benefited thereby. Now Liverpool possesses a similar system, for the lightships at Bar and Formby have recently been fitted with wireless installations. The service is to be restricted solely to the purpose of life-saving, and will secure a much greater degree of safety in the navigation of the Mersey channels.

* * *

An innovation which will be much appreciated by passengers from the Continent has been introduced by the South-Eastern & Chatham Railway on board their steamers from Calais to Dover and Boulogne to Folkestone. On application being made to the Marconi operator during the passage, first and second-class seats will be reserved in the connecting boat trains from Dover or Folkestone to London by means of the wireless telegraphy on board the steamers. No charge whatever is made for this facility.

* * *

There have been lately several French vessels disabled by the storms which have made this winter remarkable. One was the mail steamer *Sebri Brihim*, which left Marseilles for Oran on Tuesday, February 18th. She had not proceeded far before her steering gear broke down, and her captain was obliged to send a wireless message for help, which was received at the station near Pomegues and at the Lizard. Immediately tugs were sent to assist her, and she was towed into Marseilles on the following day.

* * *

Another French vessel which came to grief was the liner *Mexico*, which was hopelessly disabled by the severe storm. Her "S.O.S." call was first answered by the *Galileo*, who stood by the distressed vessel until the *Devonian*, one of the Leyland steamship liners, came in touch and made arrangements to tow the *Mexico* to Halifax. Wireless telegraphy played an important part in these manœuvres, for it was only by the reception of the message that the *Devonian* was at all able to locate the *Mexico*. As soon as the disaster was known, however, the s.s. *Florida*, a sister ship to the *Mexico*, received instructions by wireless while in mid-ocean to proceed to the disabled vessel and render whatever assistance might be necessary. Immediately the *Florida* set about to carry out these instructions, and made a long detour from her course, braving heavy seas and dense fogs, in a hopeless effort to find the crippled liner. Finally, however, she received further information by wireless that the *Mexico* had been taken in tow by the *Devonian*, so that the *Florida* was able to proceed without further hindrance to Halifax.

The *Devonian* succeeded in bringing the *Mexico* to port, but not without considerable difficulty, for the journey was made through a succession of gales, but there was no danger of further mishap, for continuous communication by wireless was kept up between Camperdown and the two ships.

It was very fortunate for the *Mexico* that she was fitted with Marconi wireless apparatus, as her cargo is valued at more than a million dollars. As it is, the *Devonian's* crew will be able to claim some fifty thousand dollars in salvage money, making the *Mexico* one of the richest prizes that have ever fallen to the lot of a merchantman to tow into an American port.

* * *

Another vessel which has cause to be grateful to wireless telegraphy is the liner *Crown Point*, which was drifting rudderless and in a helpless condition in mid-Atlantic when it was picked up by the French mail and passenger steamer *Chicago*, bound from New York to France. The *Chicago* herself

was unable to do more than send a wireless call for assistance, as she herself was unable to delay on account of the mails on board. The message was received at Queenstown, and arrangements were made for a vessel to go to the distressed liner's assistance.

* * *

The Canadian-Pacific Railway have decided to run two Round-the-World tours in connection with the maiden sailing trips of their new steamships the *Empress of Russia* and the *Empress of Asia*.

breaker, fitted up with all the latest appliances besides Marconi wireless apparatus, and with engines that will make it the swiftest vessel of its kind, will be launched shortly by the Reid Newfoundland Company.

* * *

Marconi wireless telegraphy and submarine signalling apparatus are features of the new Royal Mail steamer *Appam* (8,000 tons gross), which is now on her maiden voyage. Built for the British & African Steam Navigation Company, Ltd., by Messrs. Harland & Wolff, the *Appam* embodies the

A View from the Marconi Station at Camperdown (Nova Scotia). The C.P.R. steamer "Empress of Ireland" can be seen passing the Automatic Buoy, near the scene of the wreck of the "Uranium."

The Montreal Shipping Federation of Canada has pointed out that owing to the mildness of the winter liners can negotiate the St. Lawrence River without difficulty, while if the Government would send an ice-breaker to open up the further reaches of the river the whole of the St. Lawrence route could be opened up without much difficulty. There would be little fear of further obstruction from newly-formed ice, as after February the rapidly-growing power of the sun makes such a condition of things impossible. A magnificent ice

latest principles of watertight construction, having six watertight bulkheads, dividing the structure into seven watertight compartments.

* * *

The *Zealandic* has just returned to London after a five months' voyage to New Zealand. On her outward journey she passed the Cape of Good Hope and returned via Cape Horn. Throughout the whole of the voyage she was in complete wireless communication, not a single day passing without the reception and transmission of messages.

Our Bookshelf

"A HANDBOOK OF WIRELESS TELEGRAPHY," by Dr. J. Erskine Murray. (London: Crosby Lockwood & Son, 10s. 6d.)

That this book, which saw the light of day in 1907, should have already reached its fourth edition is evidence alike of the rapid advance of wireless telegraphy and the determination of the author to keep his work fully up to date. Dr. Erskine Murray has again thoroughly revised his book and added much new matter, and we have little to add in its praise since our review of the third edition some months ago. We note, however, that none of the points which we criticised on that occasion have been revised by the author. We are particularly surprised to find that a whole chapter and several beautiful illustrations should still be devoted to Tesla's world-wave telegraphy. In our opinion a paragraph in the historical section of the book would have sufficed for this subject, and the practical character of the work under notice would certainly not suffer by the alteration suggested. The new chapter on the "Telegraphic Efficiency of Wireless Means of Communication" is particularly interesting, and the author's methods are in marked contrast to those so often adopted for determining the efficiency for advertising purposes. All the more important factors in the efficiency of a pair of stations are touched upon, though it is obviously impossible to reduce them to a mathematical expression. The author has also added, as an appendix, the draft specification of the Imperial wireless stations, but it is certainly news to us that these stations are to be at Chelmsford, Egypt, Aden, Bangalore, East Africa, and Singapore!

* * *

"THE PRACTICAL ELECTRICIAN'S POCKET BOOK AND DIARY, 1913." (London: S. Rentell & Co., Ltd. 1s. net.)

This little book, measuring only 5½ inches by 4 inches, is as convenient to carry about as it is valuable to engineers, to whom it can be safely recommended as a thoroughly reliable *vade mecum*. There are a number of useful tables, and the information is essentially of a practical character. In a section devoted to telegraphy there is a brief reference to wireless telegraphy, the only feature of which worth mentioning being a table of wireless stations which is hopelessly antiquated. However, it is not possible to deal with so vast and important a subject as wireless telegraphy in a small pocket-book, and apart from this we cannot but comment favourably upon this well-established pocket-book, which contains much information that will be useful to telegraph engineers.

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"WIRELESS TELEGRAPHY SIMPLY EXPLAINED." (London: Percival Marshall & Co. No. 37 "Model Engineer" Series. 6d. net.)

The title of this little book describes its contents accurately. Unlike many small books recently published on the subject, it gives no instructions for making the apparatus, but limits itself to presenting a clear idea of the most important principles and methods. It is therefore a book which every amateur who proposes to start experimenting in "Wireless" would do well to read before tackling those volumes which occupy themselves mainly with the apparatus and its construction. Like the other volumes we know in this useful series, it is free, so far as we have noticed, from the occasional "howlers" which one comes across from time to time in elementary manuals. We cannot, however, approve of the last page, where among the "Signs of Punctuation" the full stop is given as "a.a.a." instead of "i.i.i.," and other signs are also rendered in an unorthodox manner.

A serial story entitled "A Pawn in the Game" will commence in the May number of the WIRELESS WORLD. The tale should prove of great interest to our readers, for, besides dealing with the important problems of the moment, it has a strong love interest, and contains many original character studies.

THE IMPERIAL WIRELESS SCHEME

THE SELECT COMMITTEE.

OFFICIAL notice of the re-appointment of the Select Committee on the Marconi Contract was given on March 13th. There is no change in the personnel of the Committee who were nominated on October 23rd. The last sitting was held on February 12th, when Mr. L. J. Maxse, editor of the *National Review*, was examined.

On February 25th a further special report by the Select Committee was issued. It stated that the Committee passed the following among other resolutions:

That the Committee propose retaining the conduct of the inquiry entirely in their own hands, but will accept the assistance of counsel (if the leave of the House be obtained) when they think it necessary;

That any persons or body deeming themselves interested who wish to appear by counsel shall make application in writing to the clerk, stating the grounds upon which they desire to appear.

POSTMASTER-GENERAL'S REPLY TO THE COMPANY.

In reply to the further letter from the Marconi Company stating that, after March 1st, they would no longer consider themselves bound by the contract of July 19th last for the Imperial Wireless Scheme, the Postmaster-General has caused the following letter to be sent:

February 24th, 1913.

GENTLEMEN,—I am directed by the Postmaster-General to acknowledge the receipt of your letter of the 20th inst. stating that after the 1st prox. the Marconi Company will no longer consider themselves bound by the contract of July 19th last.

In reply I am to repeat that the Postmaster-General does not share the company's view that they have any right to retire from the contract, and to say that he will hold himself free to enforce all his rights against the company.

I am, gentlemen,

Your obedient servant,

A. F. KING.

MINISTERS' LIBEL ACTION

IN the list of cases to be mentioned in Mr. Justice Darling's Court on March 19th were the libel actions brought by the Postmaster-General (Mr. Herbert Samuel) and the Attorney-General (Sir Rufus Isaacs, K.C.) against *Le Matin*. The actions arose out of statements published in *Le Matin*—a widely circulated paper in Paris which has offices in London—and had reference to the Marconi contract. Sir Edward Carson, who appeared for the Postmaster-General and the Attorney-General, said both actions were brought in respect of a libel of a very serious character "charging the Postmaster-General and the Attorney-General with certain delinquencies which were of a public nature."

The statements were subsequently admitted by the defendants to be false, and on February 18th they published in their paper this apology:

London, February 17th.—Special Telegrams of the *Matin*.—Under the heading "A Financial Scandal in England," I sent you on Thursday last an abstract of the rumours which had been current with regard to the accusations brought by Mr. Leo Maxse, editor of the *National Review*, against Mr. Herbert Samuel, Sir Rufus Isaacs, the Attorney-General, and his brother, Mr. Godfrey Isaacs, managing director of the Marconi Company.

The official documents of the Parliamentary inquiry, which I have just read, in no way confirm these rumours—far from it. It appears therefrom that Mr. Maxse simply said in answer to his questioners that he had repeated rumours which were floating about, and that he could in no case give the source of his information.

Under these circumstances, and pending the publication of the discussions, I take the earliest opportunity of sending you this correction with an expression of regret that I should, in perfect good faith, by communicating current rumours to you, possibly have done an injury of any sort to three men of quite unimpeachable honour.

Following the issue of the writs, added counsel, the defence put in repeated the publication of this apology, with the expression that they had no intention of making any imputation upon the honour or conduct of the plaintiffs.

Judgment was given for plaintiffs with an indemnity for costs.

Alleged Libel

The trial of Mr. Cecil Chesterton for an alleged libel in the *New Witness* on Mr. Godfrey C. Isaacs, managing director of the Marconi's Wireless Telegraph Company, will be held at the Old Bailey Sessions which commence on April 22nd.