1,500-foot wave is being reintroduced in Navy, it is known as "PA"; 1,400-metre wave is known as "XX" or "LL."

TURKEY.

It is proposed to link up the Turkish Empire by a network of W.T. stations, and the Marconi Company are to erect a 20-kw. station by November 1911, at Constantinople, and have fitted up 11 warships, four with 3 kw. and seven with $1\frac{1}{2}$ kw. sets.

The two German battleships use the old Telefunken $2\frac{1}{2}$ kw. spark sets They have never been retuned, and have the German double aerial.

The service wave is 600 metres.

Turkish characters used, other signals not understood.

Personnel very ignorant and incapable.

U.S.A.

W.T. in U.S. Navy :—

General Remarks.

Personnel.—Usually four electricians, who do no other duties, under the charge of the navigating officer, who has very little knowledge of W.T.

Call signs.—The following call signs were used at Portland :—

Connecticut, NDQ.	Louisiana, NJB.
Michigan, NJZ.	South Carolina, NSW.
Delaware, NEK.	Kansas, NQO.
North Dakota, NMO.	New Hampshire, NME.
Culgoa, NDU.	

Organisation.—There seemed to be no organisation as regards wave-lengths, and the operators were continually altering their receiving adjustments.

Apparatus.—The receiving gear was sensitive but not selective, and was rendered insensitive by strong signals. No silent cabinets were fitted.

No standardisation of arrangements was attempted, the Telefunken apparatus being arranged as convenient.

No large aerials were used.

Connecticut.—Aerial, six single wires, between masts.
W.T. office on upper deck. Power 2–3 kw., 600 volts, frequency 60. Set similar to Mark I*.
Tuning is done by an ammeter in the aerial.

North Dakota.—Aerial, six single wires, and extensions fore and aft.
W.T. office behind armour. Telefunken's latest quenched spark. 5 kw. Frequency, 500, 250 volts.
Tuning as above. On full power, ammeter registers about 30 ampères. Receiving is ordinary Telefunken.
The set mentioned in "W.T., British and Foreign, 1910," page 47, has been landed as too cumbersome.

Louisiana.—Aerial, four single wires between masts.
W.T. office on main deck. Set as for Connecticut.

South Carolina.—Aerial, four single wires, and extensions fore and aft.
W.T. office inside main mast. Installation identical with North Dakota. Designed wave-length 1,000 metres, but 500 metres usually employed.

Delaware.—Telefunken gear is used, the whole apparatus having been installed and tuned by the Telefunken Gesellschaft.

The Fessenden system is used in the following ships:—Scout cruisers "Birmingham" and "Salem." 12 k.w. Daylight range 600 miles. It is proposed to replace these sets with less powerful sets. The gunboat "Paducah," and the destroyers "Smith" and "Roe," have 2 kw. sets. Nineteen further sets are on order. A 25-kw. set is at Key West. A 100-kw. set is to be installed at Washington, with a guaranteed range of 3,000 miles.
Two kw. sets are working successfully in several vessels of the United Fruit Company.

Colon.—A 25-kw. set communicates with Key West, 924 miles, when atmospheric conditions are favourable.

W.T. Communication in the Philippine Islands.—The U.S. Government is considering proposals for introducing W.T. communication throughout the Philippine Islands, by installing six 10-kw. stations, to be supplemented later by a number of 1-kw. stations. In considering the system to be employed, Captain Wildman, of the U.S. signal corps, strongly recommends a quenched spark system, which he says is undoubtedly the best arrangement. He states that the Telefunken wagon set, using quenched spark with a frequency of 500, gives a clear singing note that can be easily read through atmospherics.

Uruguay.

A system of Telefunken stations is being established in the Republic, but as yet none of the stations are completed. The cruiser "Montevideo," and the gunboats "18 de Julio" and "Oyarvide," are to be fitted, and their apparatus arrived at Montevideo in March 1911. The high-power station at *Punta del Este* has been approved, and an estimate of 55,000*l.* accepted. The site is not yet fixed. An extra high power (1,000 kw.) is proposed for this station for the following reasons:—

(*a*) Punta del Este will have to work at great distances as compared with Clifden, as the following table shows:

Punta del Este to Coltano	5,950 miles.
„ „ „ „ Clifden	5,700 „
„ „ „ „ Glace Bay	4,860 „
Clifden to Glace Bay	1,940 „
„ „ Cape Cod	2,430 „
Coltano to Cape Cod	3,400 „

(*b*) Clifden, for working across the Atlantic, has a 500-kw. station.

(*c*) Difficulty is anticipated in sending messages across the forests of Brazil, as has already been experienced between Para and Pernambuco.

(*d*) Increased wave-length as compared with that of Clifden.

Mr. Berry, the manager of the Marconi Company at the River Plate, which is erecting the station, has stated that Mr. Marconi, during his recent visit to Argentine, informed him that if, after the installation of the 1,000-kw. apparatus at Punta del Este, experiments were satisfactory, the power of Clifden would be increased also, adding that he was already in possession of land for the purpose.

Falkland Islands.

It is proposed to erect a station to communicate (chiefly at night) with Punta del Este.
Five kw. two masts. Wave-length 2,000 metres. Position of station undecided.

Brazil.

1. The station at Fernando de Noronha is working, December 1910.

Aerial.—Four 75-metre towers at the corners of a square of side 135 metres.
Slightly directional for S.W.–N.E. for Rufisque (near Dakar) and Levrier on the African coast.

Power, &c.—Six hundred metres wave, up to 4 kw., range said to be 400 miles.
One thousand six hundred metre wave, up to 35 kw., range said to be 1,000 miles.
Power from 60 H.P. motor, working a D.C. dynamo and alternator on the same shaft. Accumulators of 300 ampère hours and a small alternator for short distances are also used.

Transformers.—Step-up to 60,000 and 80,000 volts.

Condensers.—Gaiffe type, aluminium and glass.

Receivers.—Ferrier type, mercury and platinum in acidulated water.

2. A 1,000-mile station at Rio Grande de Sul has been approved, and a similar one at Cape Frio is projected.

Belgium.

CGR (Brussels), using U tune, heard communicating with Lepel experimental station at Slough.

Holland.

SCH has been heard working with Dutch cruiser "Jacob van Hanskerk."

Argentine.

Several stations have been erected down the east coast.
The following are working:—

Cape Corientes.	Ushuaia.
Cape Virgins.	Mendoza.
New Year Island.	

Egypt.

Port Said, Lloyd's signal station, call LPD. Marconi system. Wave-length Q. Radius 50 miles.
Port Tewfik, Lloyd's signal station, call LPK. Marconi system. Wave-length Q. Open all hours.

Russia.

Call of Khivinetz is W8.

Newfoundland.

Marconi Station at Fort Amherst, St. Johns.—An experimental station has been erected at Fort Amherst to ascertain whether better results could be obtained there than at Glace Bay, as it is intended to erect trans-Atlantic stations at Fort Amherst and Petty Harbour, six miles to the southward, if the Government permit. One station will be for transmitting, the other for receiving.
Observations with regard to atmospheric disturbances, &c. are in progress, and so far it seems that atmospherics throughout the bay are steady, but at sunrise and sunset there is a dip and a rise in the atmospheric curve.

Spain.

The high-power station at Madrid (call sign MAD) uses a high clear note on wave-lengths of about 3,200, 4,750, 6,500, 8,000 feet. The first three are used with Ceuta and Melilla stations. The 4,750 wave is also used for signalling to men-of-war, the latter replying on a 2,000 feet wave. The 8,000 feet wave is used for commercial work, &c. A four-figure cypher is often used in Government messages.
Another high-power station, perhaps Cadiz, call sign MCP, has been heard on a low musical note, wave about X tune.
The following military stations have been heard:—

Station.	Calls.	Power.	Wave.
Alcazar - - -	ALC, EC3, YA	Low	3,200 feet.
Almeira - - -	ALM, FAL	Medium	,,
Ceuta - - -	CEU, EC9, ALV	,,	,,
Melilla - - -	MEL	,,	,,
Larache - - -	EC10, MOL	Low	,,
Casablanca - -	CP	—	4,000 feet.
Fez - - -	FZ	—	,,
? - - - -	RGE	—	,,

A "singing spark" is used, with 8 gaps, which can be short circuited separately to reduce the range. Power is supplied at 500 cycles by a motor alternator with automatic starter, the generator being of 4 kw. at 220 volts. A hand-worked key is used. The current passes through an impedance coil with an adjustable iron core sliding in and out, and the voltage is stepped up to 13,000 by an open-core transformer. The primary capacity is made up of large leyden jars; total capacities of ·028 or ·056 microfarads being used.

The perikon detector, with Wireless Speciality Company's receiving gear complete, is used; and the pyron detector is used for short ranges. The latter is said to be stable, but rather insensitive.

The Telefunken supply a detector of silver pyrites and brass wire; it is said to be difficult to adjust, and not as sensitive as the perikon. They also supply a detector containing silver filings in a short glass tube, from which the Americans have never been able to obtain satisfactory signals.

The send-receive switch is a hand-worked high-tension switch, which, when put to "receive," stops the spark gap fan and breaks the generator field to prevent singing in the telephones.

The office is wood lined to prevent noise, and all leads in primary and aerial circuits are of stout copper strip about 1 inch wide.

The ship does not carry a wavemeter, tuning curves being supplied by the company.

BELLINI-TOSI DIRECTIONAL SYSTEM.

(*See* Annual Report, Appendix, 1907, p. 61, and 1909, p. 54.)

This system has been on trial in the French Navy, and it appears that the relative bearings of ship-and-shore stations at distances up to 12 miles can be located to within about 4 degrees, but no definite reports of results over longer distances have been received. The results were obtained by using suitable aerials in conjunction with a "radiogoniometer" at the receiving end. The radiogoniometer consists of two fixed coils and one movable coil (*see* Annual Report, 1907, p. 61), the bisector of the angle between the positions of the movable coil when weakest signals are obtained indicating the direction of the sending station.

For directional transmitting purposes, a radiogoniometer in conjunction with suitable aerials is used at the transmitting station.

SPARK PHOTOGRAPHY.

The following extracts, taken from reports by Captain R. ff. Willis, R.M.L.I., on his system of spark photography, are considered to be of sufficient interest to be given *in extenso*:—

An Accurate Method of tuning Coupled Oscillatory Circuits by photographing the Primary Spark Trains.

The enlargements shown in Plate XII. are photographs of trains of X wave-length primary sparks, and illustrate the degree of certainty and accuracy with which the tuning of the primary and secondary circuits can be checked.

The definiteness of the blank interspace between the commencing half group and the succeeding whole group of sparks in a train is a measure of the accuracy of the tuning, and it will be seen that when the sparks are not accurately in tune the blank interspace merges into the spark groups on either side.

The photographs lettered A, B, C, and E were taken under high-speed conditions, and those lettered K, M, N, and O under slow speed conditions, the latter speed being approximately one-ninth of the high speed.

The distance between the primary and mutual coils was kept the same for all photographs, the only alterations in the circuits being those made on the aerial coil, as shown in the following table:—

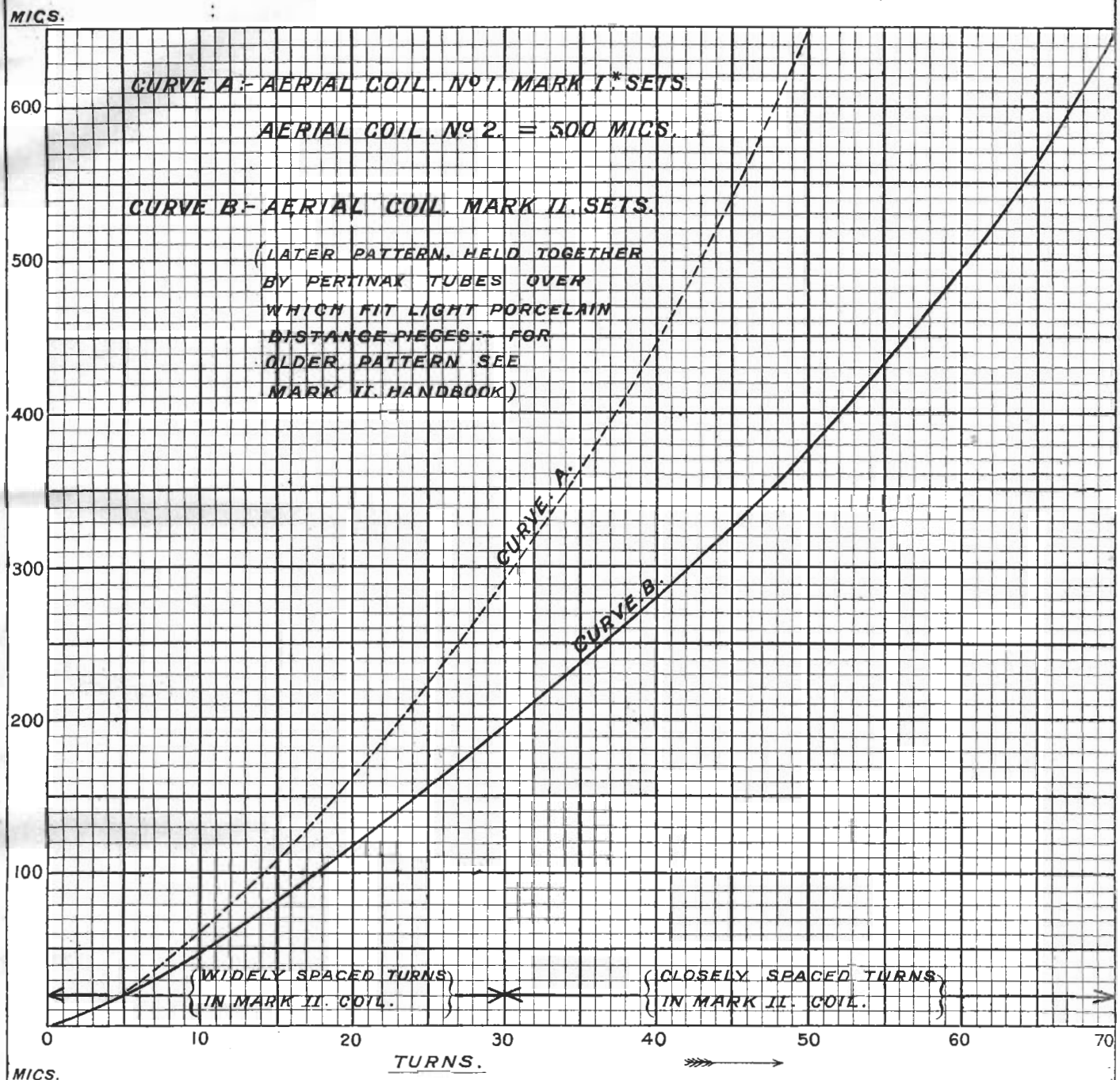
Speed.	Letter.	Part of a Turn added or taken off Aerial Coil.	= Mics.	Definiteness of Blank Space.
High	A	+ Two-sixths.	+ 2½	Hardly defined.
	B	+ One-sixth.	+ 1¼	More defined.
	C	Correct tuning.	—	Well defined.
	E	— Two-sixths.	— 2¼	Hardly defined.
Slow	K	+ Four-sixths.	+ 5	Not defined.
	M	+ Two-sixths.	+ 2½	More defined.
	N	Correct tuning.	—	Well defined.
	O	— Two-sixths.	— 2¼	Less defined.

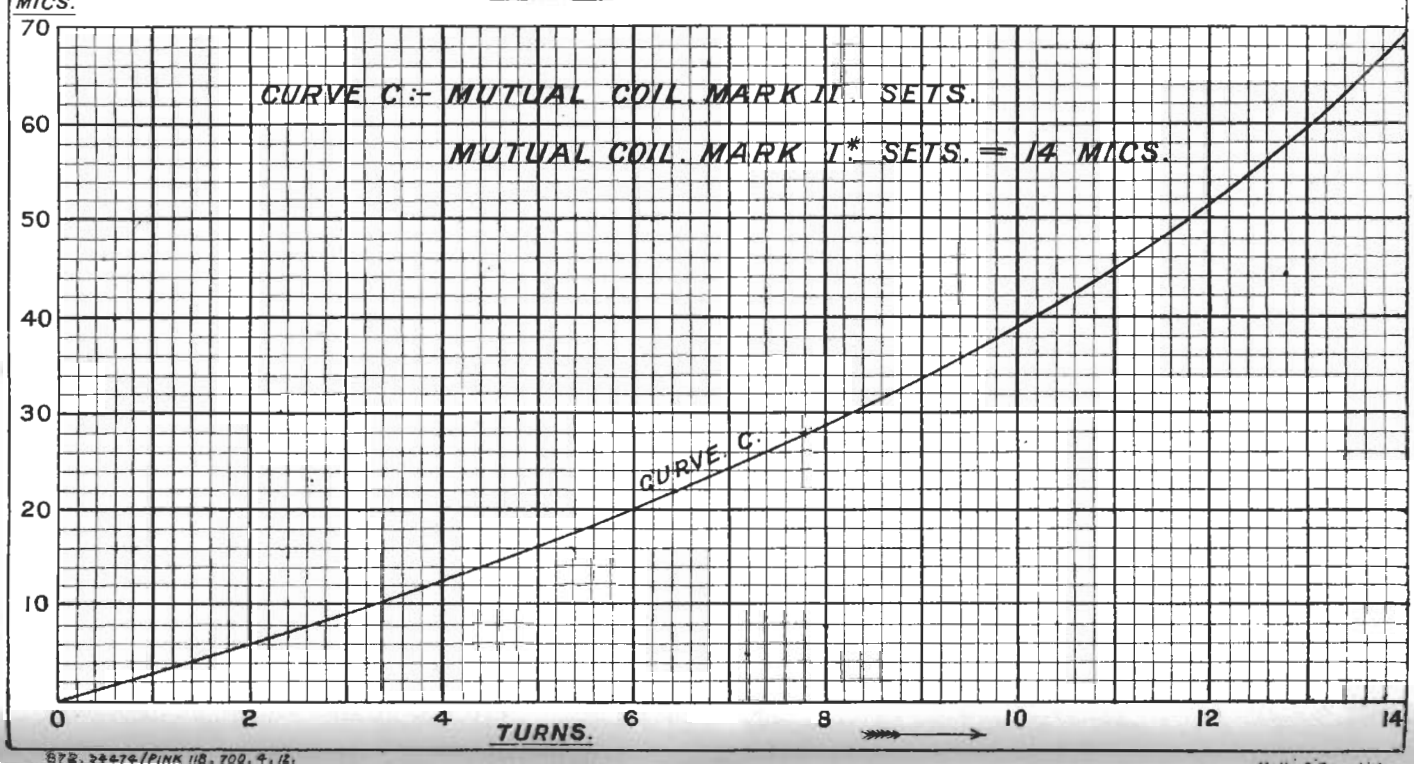
Note.—The aerial capacity is 15½ jars.

It will be noted that, except for speed, A corresponds to the conditions of M, also C to N, and E to O.

The edge of each film was divided off into ½-inch intervals, so that the extent of the enlargement could at once be seen.

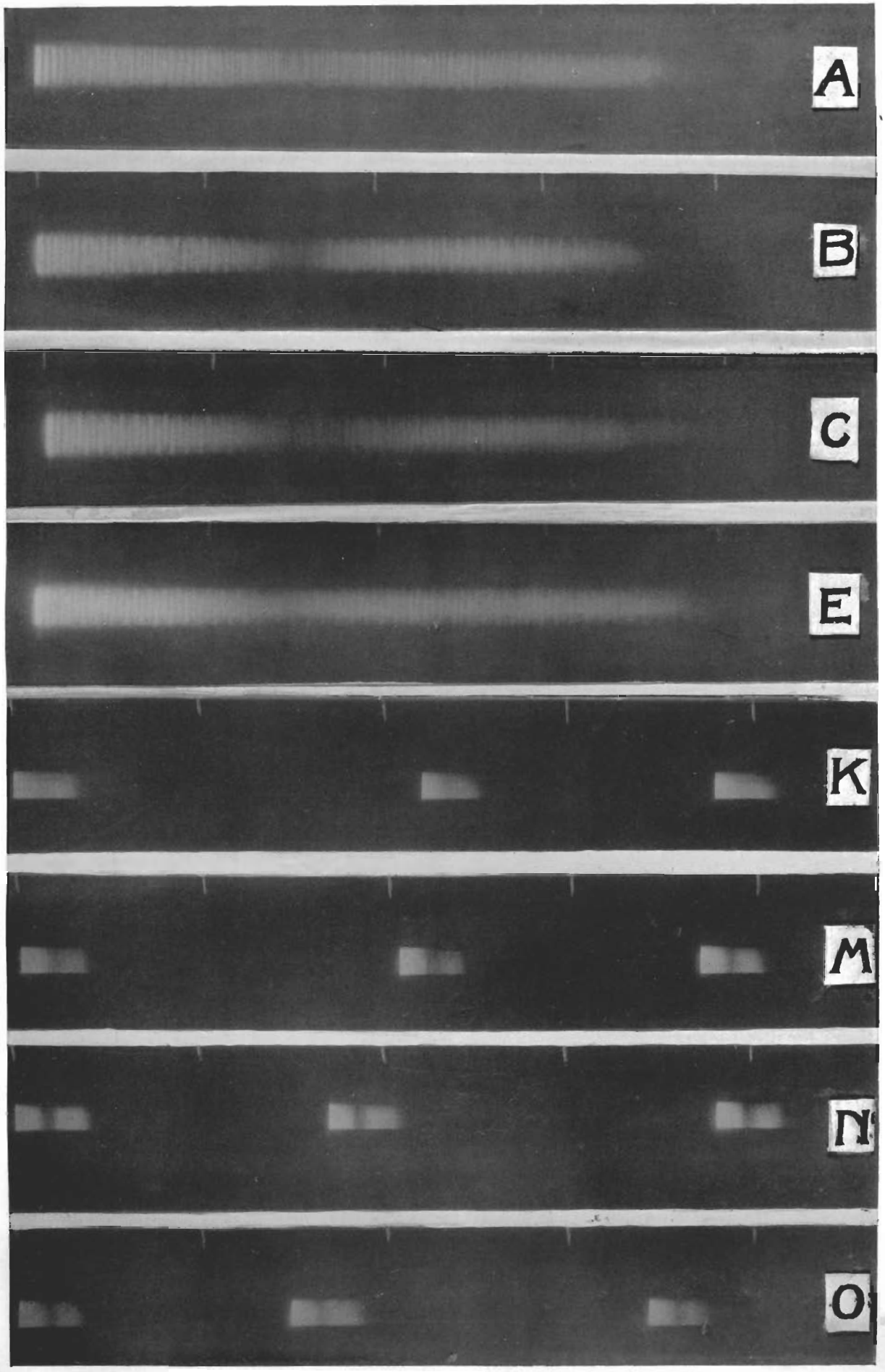
INDUCTION CURVES FOR AERIAL AND MUTUAL COILS.





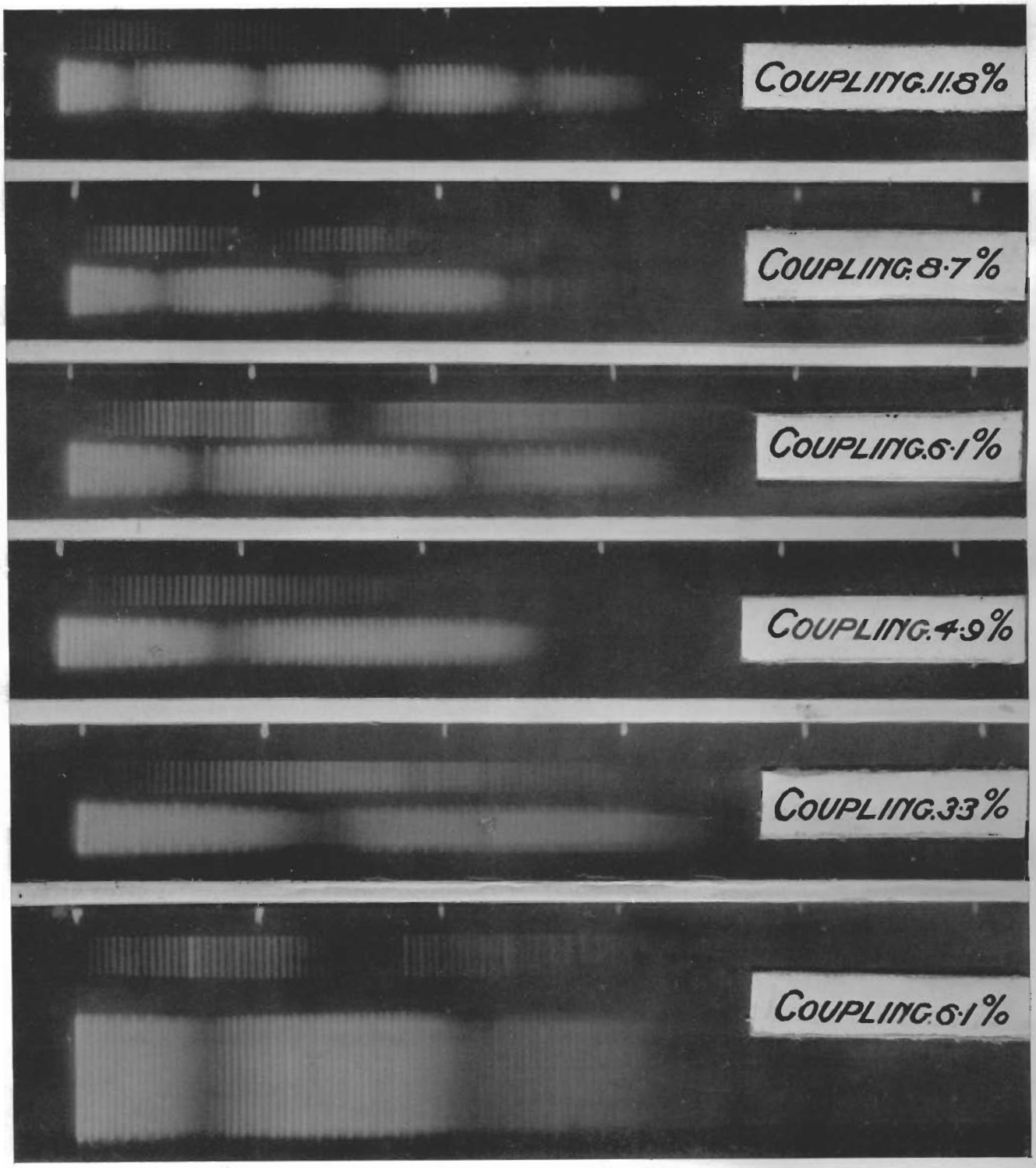
S.T.S. 28474/PINK 118. 700. 4. 18.

SPARK PHOTOGRAPHY.



To face page 38.

SPARK PHOTOGRAPHY.



To face page 39.

Photographs taken at one-sixth turn distant from the correct tuning position at slow speed do not show any appreciable difference (and so have not been included), and therefore it will be seen that high-speed photographs are somewhat more sensitive to accurate tuning, although it is found in practice that by taking a series of five photographs at slow speed with one-third turn alterations, the above and below tuning photographs can be easily matched, and that the mean adjustment gives the correct tuning position as accurately as under the high-speed conditions; also, under slow-speed conditions, twice as many photographs can be taken within half an hour owing to the less time occupied in speeding up and stopping, and nine times as many specimen trains are obtained on the same length of film.

It is not suggested that this method of tuning should take the place of the wavemeter, but having once found the approximate adjustment by means of the wavemeter, then a series of photos could be taken in order to get fine adjustments; and after this it would only be necessary to take one photo at weekly or monthly intervals and, by comparing it with the original series, it could at once be discovered whether even a very slight alteration had taken place in the wave-length of either circuit; over one dozen specimen spark trains are obtained on each high-speed record (when the spark-train frequency is 500) and nine times this number on a slow-speed record.

By counting, it will be seen in B and C photographs that there are $33\frac{1}{2}$ sparks in the first half group of the train, which tells us that the coupling percentage is $100/33\frac{1}{2} = 3$ per cent., and this appears to be a very ready and accurate way of determining the coupling percentage.

At high speed only loose couplings of $3\frac{1}{2}$ per cent. and less are sensitive to the difference of 1 mic in the aerial inductance.

It has been found that tight couplings require several mics added or taken off before any difference can be detected.

Tuning with the wavemeter, using a 5 per cent. coupling and varying the adjustments on to aerial coil from a half turn up to a half turn down from the correct tuning position, the mean of the double readings obtained in every case lies within $\pm \frac{1}{2}^{\circ}$ of the mean reading of the correct tuning position, therefore it is a very easy matter to be a whole half-turn out of correct adjustment when using the wavemeter, but impossible when using the photographic method, where permanent records are obtained, and these are always available for inspection and comparison.

Double-spark Photographs.

Plate XIII. shows enlargements of photographs of double trains of sparks, *i.e.*, primary and secondary trains of sparks photographed simultaneously on the same film, and the effect of gradually loosening the coupling is visibly demonstrated.

A small spark of $1\frac{1}{2}$ mm. was inserted in the secondary circuit and a spark of 8 mm. used in the primary: wedge-shaped spark plugs being used in each case and subjected to a strong air blast, so that the trains were not excessively prolonged.

X wave-length was transmitted, which gives a *spark frequency* of approximately 200,000 *per second.*

The edge of each film was marked off with $\frac{1}{2}$-inch intervals, so that the extent of the enlargement could at once be seen.

The coupling percentages work out as follows:—

——	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
No. of sparks in the first half-group of the primary train.	$8\frac{1}{2}$	$11\frac{1}{2}$	$16\frac{1}{2}$	$20\frac{1}{2}$	$30\frac{1}{2}$
No. of sparks in any one whole group of the primary train.	17	23	33	41	61
The coupling - - -	200/17	200/23	200/33	200/41	200/61
Percentage - - - -	11·8 per cent.	8·7 per cent.	6·1 per cent.	4·9 per cent.	3·3 per cent.

The last photograph shows double trains of sparks of the same coupling percentage as in No. 3.

Neither the negatives nor the prints, from which the plates have been made, have been retouched in any way whatsoever, as this would destroy their interest and value.

ANALYSIS OF TENDERS FOR W.T. INSTALLATION.

The following information with regard to tenders for W.T. installations by the principal commercial companies is of interest as showing the prices and conditions specified by the various firms, and it will be noticed that the prices of similar service installations would compare favourably with those quoted.

Analysis of Provisory Tenders received.

Firm and Total Cost of Contract.	Power, Kilowatts.			Cost, Pounds sterling.			Wave-lengths Transmitter.			Wave-lengths Receiver.			Musical Note.	Range, Kilometres.			Type of Receiver.	Delivery.
	S.	L.M	S.M.	S.	L.M.	S.M.	S.	L.M.	S.M.	S.	L.M.	S.M.		S.	L.M.	S.M.		
Telefunken - - Sterling, 16,416*l.*	10	2	·75	5,900	1,120	900	600 900 1,200 1,500 1,800	300 450 600 900	300 450 600	—	250 to 3,000	—	Guaranteed musical note can over-read atmospehrics and other systems at present in use.	*Day.* Not stated.	600	250 to 300	Selector type not mentioned.	**Delivery in 3 months. Erection in 4 if preliminary work (*e.g.*, lengthening masts) is carried out.**
														Night. Not stated.	1,000	—		
United, U.S.A. - Sterling, 11,940*l.*	5	2	·5	3,040	1,120	820	Not mentioned -			Not mentioned -			No guarantee or mention of musical note.	*Day.* —	600	100	Not mentioned -	**Naval installations completed in 3 months.**
														Night. —	1,400	250		
Marconi - - Sterling, 14,000*l.*	20	3	1½	7,840	525	495	2,400	300 600	300 600	100 to 2,500			Guaranteed musical note.	*Day.* 1,200	550	350	Selector type stated able to cut out interference from atmospherics.	***Delivery.*** **1–1½-kw. set in 1½ mths.** **1–3-kw. set in 2 mths.** **1–20-kw. set in 5 mths.** ***Erection.*** **1–1½-kw. set in 7 days.** **1–3-kw. set in 14 days.** **1–20-kw. set in 90 days.**
														Night. 2,400	1,100	700		
Poulsen - - Sterling, 23,975*l.*	15	3	1	8,450	1,650	1,275	500 to 3,000	500 to 2,000	—	150 to 4,000	150 to 4,000	150 to 2,500	Guaranteed six different musical notes.	*Day.* 1,500	550	300	**Selector type stated able to diminish strength of atmospherics.**	**S. in 5 months.** **L.M. 4 months.** **S.M. 3½ months including erection.**
														Night. Not stated.				
Lodge, Muirhead -	—	3·5	—	—	1,000	—	—	600 to 1,800	— —	—	300 to 3,000	—	**Not mentioned** -	*Day.* —	500	—	**Selector type.**	
														Night. —	—	—		
Cie Francaise de Telegraphy sans fil. Sterling, 20,650*l.*	9	3	1	8,180	1,560	890	300 600	300 to 800	100 to 400	300 to 4,000	200 to 4,000	—	Not musical note	*Day.* 1,000	600	350	Selector type -	***Delivery.*** **S. 5 months.** **L.M. 4 months.** **S.M. 4 months.** ***Erection.*** **S. 8 months.** **L.M. 5 months.** **S.M. 5 months.**
														Night. 2,500	2,000	—		

NOTE.—S. = Shore station. L.M. = Large Marine Installation. S.M. = Small Marine Installation. Wave-lengths are in metres. Ranges are in kilometres.