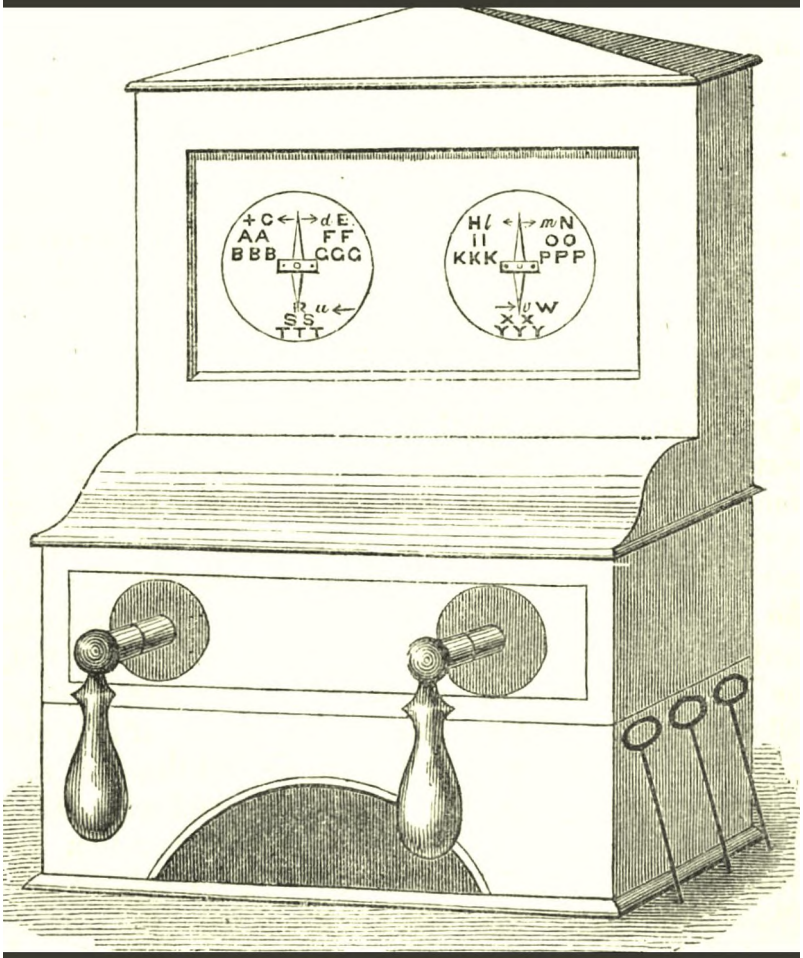

The handbook of the telegraph

R. Bond

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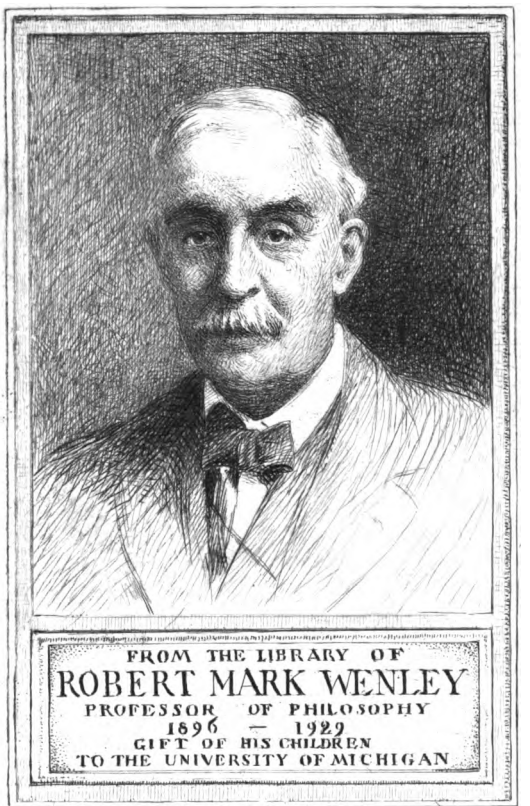

THE

HANDBOOK OF THE TELEGRAPH.

BEING

A Manual of Telegraphy,

TELEGRAPH CLERKS' REMEMBRANCER,

AND

GUIDE TO CANDIDATES FOR EMPLOYMENT IN THE TELEGRAPH SERVICE.

BY R. BOND,

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CONTENTS.

HANDBOOK OF THE TELEGRAPH.

CANDIDATES for the vocation of telegraph clerks should be capable of writing a free and distinct hand, of spelling correctly, and, as correspondence will form a portion of their duties, of adapting their communications to grammatical formula; a slight acquaintance with arithmetic is also essential; higher attainments than these are not actually indispensable to the ordinary clerk, although they may realise to their possessor advantages which the less accomplished would scarcely have reason to expect or hope for. An "instrument clerk" may be quite competent to telegraph or receive a despatch in a foreign language, and yet not understand a single word of it; but, as the Continent and many other parts of the globe are intersected by the telegraph, clerks and other officials must of necessity be located in foreign countries, and to those who are privileged with such stations, the qualifications of a linguist will form an important element in moulding the eventualities of their career. That foreign situations are generally more lucrative than appointments in this country, is an admitted fact, and when they are at disposal, it is obvious to whom the preference would be accorded, unless favouritism or interest interpose; besides, there are foreign departments, attached to which are numerous *employés*, in the chief home offices of the British telegraph companies, to which clerks who are conversant with the language of other countries may be drafted.

Although allusion has been made to the favourable circumstances under which the accomplished scholar identifies himself with the service of those companies that have direct communication with other nations, it must not be construed that the official who is destitute of such acquirements should consider his position to be stationary, as, on the contrary, his course may be a progressive one. Constant practice enables him to signal, *i. e.* to send and receive messages, and to write with celerity; and if he applies himself to his duties as assiduously as is expected of him, and determines upon becoming acquainted with the why and the wherefore, he may not only render himself a proficient instrument clerk, correspondent, and accountant, but also attain to a thorough knowledge of the principles of electricity, which operates so surprisingly, and with such exquisite accuracy, in exchanging thoughts, although conceived in different climes, and hundreds of miles apart, with the rapidity of lightning,* hence annihilating distance and concentrating time, conveying tidings of the movements of an army, the rise and fall of dynasties, or the desires of a peasant, with like facility and marvellous speed. If the acquisition of a knowledge of the mysteries of this wonderful agent be the clerk's ambition and aim, opportunity will aid the will in demonstration of the fact that the zenith of his aspirations is within his flight, and perhaps assist in distinguishing him as an illustration of the truthfulness of the poet's sentiments—

> "There is a tide in the affairs of men,
> Which, taken at the flood, leads on to fortune."

In the telegraph management there is a feature that is especially commendable. We allude to the solicitude for the development of the mental faculties, as evinced by the establishment of a free library, of good, useful, and entertaining works, treating on all subjects, which are at the disposal of the clerk, who has generally an abundance of time to devote to the mind's culture; the means, therefore, of enriching himself in knowledge are within his reach, a literary repast is

* The electric current travels at a velocity of two hundred thousand miles per second.

spread, and he is invited to partake of it. The various grades in the correspondence, and the higher positions in the engineering department, shine forth in the prospective as stimulants to exertion, as rewards to diligence, perseverance, and adherence to the regulations laid down for his guidance. The juvenility of many of the clerks denotes a freshness to business —a recent withdrawal from school to take part in the active concerns of life: youths of fourteen are deemed eligible for the post, and sharp, intelligent lads sometimes enter the service even at an earlier age, and the employment seems so congenial to their taste, that, unlike other tasks, it is viewed by them with the pleasurable emotion of an agreeable pastime; nor does this feeling abate, it grows with their age, and, as a consequence, they frequently out-distance those whose induction dates at a later period of life, and hence earn for themselves the reputation of first-class readers. Some of these clerks, with whom the author is acquainted, have been known to receive two hundred and forty words, on the double instrument, within three minutes. Female clerks are also comprised in the telegraph staff, and they certainly manifest an adaptability for the calling. One of the offices of the London chambers of the Electric Telegraph Company is exclusively appropriated to the lady clerks, who number upwards of a hundred. These are under the immediate supervision of a "chief matron," and are daily holding converse with the remote, by the "wonder-working wire," which

> "Marks how bold Invention's flight
> Makes the widest realms unite;"

and their cheerful demeanour stamps it as a delightful occupation—one, too, which inspires them with a lofty idea of the part they play; and the confident air assumed by the more expert, when influencing the rapid transition of the needles, expresses explicitly as looks or mien can do—

> "Speak the word, and think the thought,
> Quick 'tis as with lightning caught,
> Over, under, lands or seas,
> To the far Antipodes.
> Now o'er cities thronged with men,
> Forest now, or lonely glen;

Now where busy Commerce broods,
Now in wildest solitudes;
Now where Christian temples stand,
Now afar in pagan land.
Here again as soon as gone,
Making all the earth as one.
Moscow speaks at twelve o'clock,
London reads ere noon the shock,—
Seems it not a feat sublime?
Intellect hath conquered Time!
Sing who will of Orphean lyre,
Ours the wonder-working wire!"

The spectator's interest is naturally enlisted; a train of thought and reasoning ensues. The poor needlewoman found an able advocate in Hood, and in the influential pens of other writers; benevolence pitied and relieved; the artificial flower makers have had their sympathisers; and doubtless others of the gentler sex, who derive their subsistence from the toil and labour of their own hands, have endured, and still experience, privations which are unknown, or known but to the few besides. And why such distress in this land of wealth? why exists this cause for pity? Contrast the two great sections (male and female) of the population numerically with each other; compare the vocations, innumerable and various, which are assigned to the lesser with the few of the greater, and the cause is obvious. Open to women a wider and more diversified field of operation; accord to them a less dependent position than that which they now occupy, and we may augur well for the result.

The telegraph exhibits the perceptive and concentrative faculty of females to equal advantage with that of their brethren of the guild; they catch the movements of the needle, and interpret them, with surprising avidity; and the success of the experiment in employing them is suggestive of the inference that it may be extended, until the telegraph service becomes universally popular as an avocation for the female. Unfortunately, employment for this section of the community is, as before observed, limited but to few branches, the employment in most of which is viewed with repugnance by many, who deem it as detractive from caste, as degrading to position; hence, many a mind,

many a hand, which might contribute to the prosperity of themselves, a household, a nation, is inactive, useless, and reliant upon the energies of the sterner sex to a greater extent than is compatible with the possessor of self-reliant capabilities; therefore, the discovery of a new source that is likely, in however small a ratio, to inspire emulation, to arouse dormant energies, and to call latent intellect into life and action, must be a matter of congratulation to the right thinking.

Applications for clerkships should be made to the secretary, and the prospect of their favourable reception is enhanced by their being accompanied by testimonials emanating from the last employer of the candidate, or (if he has not had a previous engagement) from the head of the establishment in which he was educated, and from one or two other respectable parties to whom he is known. He is then supplied with a printed sheet, termed the *Form of Application*, comprising a series of interrogations, which must be replied to in the order in which they occur.

FORM OF APPLICATION.

Christian and Surname of Candidate.

Residence.

Age last birthday.

Nature of last Employment.

Address of last Employer.

Reason for leaving last Employment.

Salary received.

Salary now expected.

Names and Addresses of Referees.

Signature of Candidate.

The other side of the sheet is headed "Exercises from Dictation." Underneath this he is supposed to write as the clerk in charge of the station which may be situated in the town

he may be a resident of, or other appointed person, may dictate; but more generally he has to transcribe a paragraph from a newspaper or book, as, for example :—

"We are told that woman's mission is a domestic one, that her character and position do not admit of her taking a part in the decision of public questions; that politics are beyond her sphere. But this raises the question—Who shall say what her sphere is? Amongst the Pawnees and Sioux it is that of a beast of burden; she has to carry the baggage, to drag home fuel from the woods, and to do everything that is menial and laborious. In slave countries it is within woman's sphere to work side by side with man, under the lash of the task-master. Clerkships, cashierships, and other responsible business situations are comprised in her sphere in modern France; whilst, on the other hand, the sphere of the Turkish or Egyptian lady extends scarcely an inch beyond the walls of the harem."

Or—

Hark! the warning needles click,
Hither, thither—clear and quick,
Swiftly swinging to and fro,
Tidings from afar they show.
While the patient watcher reads,
As the rapid movement leads,
He who guides their speaking play
Stands a thousand miles away.
Eloquent though all unheard,
Swiftly speeds the secret word;
Light or dark, or foul or fair,
Still a message prompt to bear."

Or—

"So it falls out,
That what we have, we prize not to the worth
While we enjoy it; but being lack'd and lost,
Why then we reck the value; then we find
The virtue that possession would not show us
While it was ours."

In addition to this, he may probably have to undergo a colloquial examination in orthography, which is generally conducted by the district superintendent, or clerk in charge of the station, of his *locale*. If it be deemed and reported upon by the examining party as satisfactory, he commences his instructions forthwith, and remains on probation for a fortnight. If at the expiration of that period he be capable of sending twenty, or receiving fifteen words per minute, he is finally installed as clerk. From the latter time his pay commences.

Messengers may be appointed by the clerk in charge, or district superintendent, subject, however, to the approval of the secretary or directors, by whom all applications are confirmed or otherwise. As good conduct entitles the messenger to promotion to the rank of junior clerk, he has to submit to a similar examination to that of the clerk, and to supply answers, &c., as demanded in the foregoing form of application. Each of the officials is, upon the occasion of undertaking office, furnished with a book containing certain instructions for his guidance in the receipt, delivery, and transmission of messages, &c., and he has to subscribe to certain conditions, constituting a

DECLARATION OF SECRECY.

I, the undersigned, now being a salaried officer in the employment of the Telegraph Company, do hereby promise and declare that I will observe the strictest secrecy in respect to all telegrams, business and other matters, from time to time transmitted, made, or communicated by me, or coming to my knowledge in the course of or during my said employment; and that I will never at any time, without the consent of the Board of Directors of the said company, disclose, divulge, or make known to any person or persons connected with the establishment at the time being of the said company, or to any other person, any of such telegrams or other matters, or the purport thereof, respectively, or anything in any manner relating thereto, unless compelled so to do by a court of law or equity, or other competent tribunal.

As witness my hand this day of 18 .

Superintending Clerk.

Witness.

It is not difficult to conceive the object of imposing conditions of secrecy; the disclosure of a telegram might endanger the position, the solvency, and ruin for ever the prospects of the parties whom it concerns. It might defeat the ends of justice, frustrate projects of utility, and operate otherwise perniciously on the individual and the nation. The necessity of keeping faith with the public is therefore of moment. Telegraph companies are thus impressed; hence immediate dismissal follows the divulgence of the most trivial

matter, and their bye-laws authorise the infliction of a penalty on those of their staff who improperly reveal a message. So desirous are they of preserving the inviolability of secrets entrusted to them, that even their clerks, when not on duty, are prohibited to enter the instrument room, and are enjoined not to hold communication with the public when on duty, save as respects the telegrams having reference to them; forfeiture of confidence, and their situation also, attends the discovery of the revelation of a communication to a fellow servant. Like penalties also await the offender who permits any other than those who are deputed by the directors to examine despatches or registers, unless it be in the discharge of his duty. There are other irregularities which might be productive of mischievous, indeed, in some cases, ruinous results; and the directors are necessarily obliged to employ measures to deter the commission of them. Instances of carelessness, insubordination, &c., are visited by fines, the amounts of which are regulated by the emolument derivable from the situation; for example:—

Illegible and careless writing	⅛ of a day's pay.
Playing, absence without leave, errors in figures and dates, and disorderly conduct.	
Insubordination, not counting, or miscounting	
Mis-spelling and special errors	¼ „ „
Message errors and loss of message	1 „ „

The privilege of an appeal to the Board of Directors is accorded to the aggrieved, and the power of dismissal is generally reserved by that body. Punishment is certainly not a pleasing theme to dilate upon, nor is it by any means calculated to attract votaries to any standard; still, no matter what name it assumes, it is recognised in every establishment as a stern necessity, one which the evil only, not the good, have cause to fear; and nowhere more than in the telegraph office does a divergence from the path of duty justify its institution, although it must be conceded that its opposite often proves a more powerful instrument towards accomplishing similar results. In every phase of life, in the commercial and mercantile world, the trading emporium, the office, and

concerns in general, public and otherwise, the basis of usage affecting the *employé* enunciates a conformity of the views of the employer with this principle—pecuniary advantage and improved position are made a consideration; and thus it is with the telegraph service, certain and sometimes speedy promotion recompense the energies of the disciplinarian; the messenger ascends the official incline, he becomes a clerk; the clerk glides on, step by step, from grade to grade, and

"Hope is swallowed in the vast reward."

We will not hazard an opinion as to the consistency of public companies in respect to their officers,—we will not pretend to divine as to whether it be reconcilable with their conscience or otherwise, to advocate the poet's sentiments—

"Let none presume
To wear an undeserved dignity.
Oh, that estates, degrees, and offices
Were not derived corruptly! that clear honours
Were purchased by the merit of the wearer!
How many then should cover that stand bare!
How many be commanded that command!"

Whether such lofty ideas actuate them in their disposition of preferments is not our province to investigate; but it must be observed that whatever be the effect, the governing bodies of telegraph companies encourage the operation of effectual means for the discovery of superior talent. Unlike many who are engaged in official capacity, the telegraph clerk is occasionally subjected to a test of skill. In the case of a Queen's speech, a government proclamation, or a foreign message of importance, a premium is generally awarded to the sender and receiver who accomplishes the task within the least space of time; a pre-eminence is thus assigned to them, and their abilities are prominently brought under the cognisance of the directors.

A fortnight's holiday during the year is granted to each of the officials, and clerks are employed to visit the various stations for the purpose of temporarily supplying the place of the absentees.

A benevolent society is constituted of the members of the

company, to which those who feel disposed may contribute, to secure a provision in case of sickness, old age, and a sum to their friends in the event of death.

When the directors determine on the transfer of a clerk to another station, he must comply, unless there are peculiar reasons for his continuing where he may then be. Such removals are of course unattended with expense to the clerk. When a telegraph is connected with a railway system, the officials engaged on it have extended to them the privileges of a free conveyance within its limits.

Clerks are supposed to devote the whole of their time to the service; or, in other words, they must not during their term of office engage in any other vocation.

The term of notice of resignation varies from one to three months.

Many of the railway companies have in operation over their lines telegraphs of their own, or wires which are worked by their own servants, generally lads, who are under the supervision of the station superintendents. Their appointment is vested in the railway company's telegraph superintendent, subject, however, to the approval of the board of railway directors. The duties of these clerks are confined to the telegraphing the times of arrival and departure of trains, the transmission of messages on railway business only. The course of examination consists of reading and spelling. After passing that ordeal they commence their instructions upon the instrument; and when they are competent to send and receive a message their pay begins, generally at about seven shillings per week, which is subject to an advance until it reaches its maximum, when, if their conduct warrants it, and they should have profited by the spare time and opportunities which present themselves in qualifying themselves for the post of booking or goods clerk, the recommendation of their superintendent will be conducive to their appointment as such.

The denomination of officials in the correspondence department of telegraph companies include messengers, counter clerks, cashiers, clerks in charge, district superintendents, on whom also devolves the supervision of the engineering department in the district.

At minor stations the duties of the cashier, counter, and clerk in charge are combined.

The commencing pay of the clerk varies from ten shillings upwards per week.

The Messenger.

This officer's stipend is regulated by circumstances, the minimum amount being about seven shillings. His duties are, to deliver messages to within the radius of half a mile free of charge, and beyond that distance at the following rates:—

						s.	d.
Above ½ mile, and not exceeding				1	mile...	0	6
„ 1 „		„		2	„	1	0
„ 2 „		„		3	„	1	6

When circumstances render necessary the employment of a fly, cab, or other conveyance to expedite, these charges are duplicated. These receipts are not, of course, applied by him, but handed over to the company, except the service is performed after the ordinary hours of duty, when they become his perquisite. He has an opportunity, and is indeed enjoined, to make himself acquainted with the telegraph; and when he is deemed competent, is promoted to the rank of junior clerk, and has equal chances of advancement with those who commenced in the latter capacity. The ages of the messengers vary from ten years upwards.

The Counter Clerk.

The duty of the counter clerk is to receive messages or telegrams from the public, and to transfer them to the forwarding clerk for transmission. The charges have to be computed and payment obtained by him, he accounting to the cashier for all moneys he may receive on behalf of the company. He has also to enclose the received telegrams in properly addressed envelopes, and to see to their despatch by the messenger.

Instrument Clerks,

As the name implies, have to attend to the instrument for the purpose of transmitting and receiving messages.

The Cashier.

The duties of the cashier are sometimes confined to his station only, if a large one; but they more frequently extend over a district, or the whole system of the company.

Clerk in Charge, or Superintendent of the Station.

Among the duties devolving upon this officer are those of enforcing discipline and a rigid adherence to regulations from his subordinates; to see that the various accounts are duly rendered; to report periodically or otherwise, as circumstances demand, on the requirements of his district, the state of signals, and the means, if any, of more widely extending the business of the company. He is responsible for his staff being in a state of efficiency, and of a due appropriation of their duties. Included in the books which are generally kept bv himself are—

The Diary, which is a record of the condition of signals, interruptions, delays from inattention at correspondent stations, and other matters of moment.

The Complaint Book, which should contain reports made by the public against members of his staff.

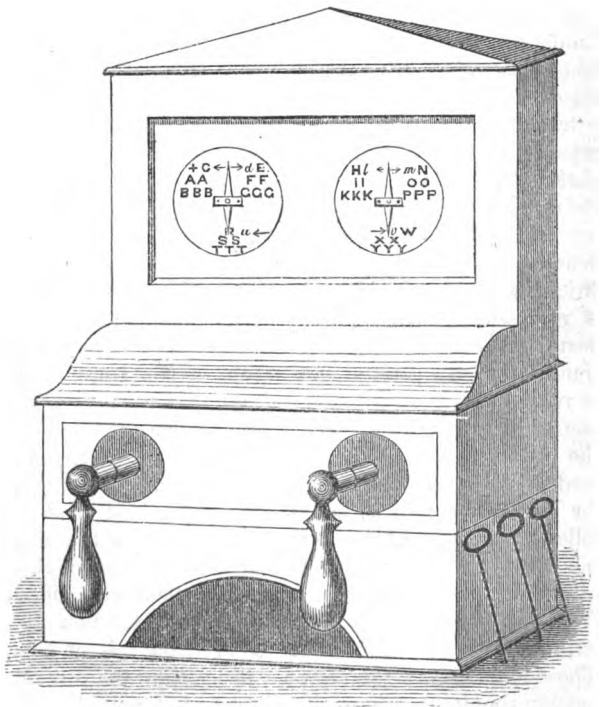
The Postage Book, in which is registered the names and addresses of parties to whom post letters may be sent by him.

The General Order Book.—In this book are posted those orders which are issued from time to time from the chief office, and which have reference to his duties and the working of the line.

The Telegraph Instruments consist of the DOUBLE NEEDLE, the SINGLE NEEDLE, and the PRINTING.

THE DOUBLE NEEDLE INSTRUMENT.

This was originally, and until recently, the only instrument in general use, and is even now considered the most rapid

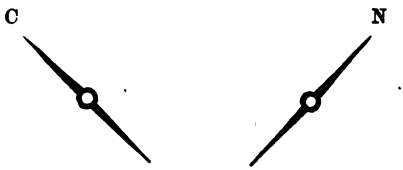


means of telegraphic communication; indeed, it is still almost invariably employed in the transmission of speeches from the throne and important parliamentary debates. But upon the principles of economy and accuracy, the single needle bids

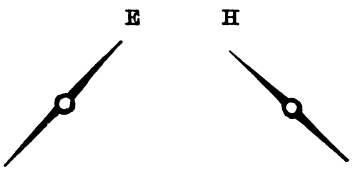
fair to supersede it. In pernicity, however, the double needle excels in the ratio of two to one.

It is so named from the peculiarity of its construction rendering necessary the use of two needles in the formation of the letters of the alphabet. Each of these needles has assigned to it the central position of a disc or circle, and when not in operation points to the north and south; their movements are regulated through the internal portion of the instrument, which is operated upon by two handles, each handle affecting the needle of that disc only which is immediately above it. The alphabet is distributed over the two discs precisely as shown in the diagram, and the respective letters, with the exception of C, D, U, V, L, and M, are indicated by one or a succession of vibrations (or, in telegraph phrase, *beats*) of the needle or needles, as the case may be, in the direction of the letters to be described; hence, A appearing in duplicate on disc No. 1, must in consequence be denoted by making the needle of that disc point or beat twice in rapid succession towards it. In like manner, B is represented by a triplicate, or quick repetition of three beats in the same direction. C is represented by a rapid transition of the point of the needle of No. 1 disc from left to right; and D, on the contrary, requires the reverse movement, viz., from right to left. In like manner, the beats of the needle of disc No. 2 are expressive of the letters in immediate proximity to it; thus, the beats to the left are, one for H, two for I or J, and three for K; and it therefore follows, that those letters on the opposite side of that disc are indicated by one beat for N, two for O, and three for P. The vibrations of this needle for L correspond with those for C of that one on disc No. 1, and the like operation to that with No. 1 needle for D, is required on this one for M. Those letters below the discs are denoted by the two needles beating simultaneously to the right or left, according to the position occupied by them, as for example:—R is indicated by both needles pointing once, S by two beats, and T by three beats to the left; and those letters underneath the disc No. 2 require the beats to be made to the right, one beat by both needles being expressive of W, two of X, and three

of Y. The letters U and V are represented by the motion of the needles in rapid succession, the former from left to right and the latter from right to left. Z is denoted by directing the upper or south point of the needle of disc No. 1 to C, and that of disc No. 2 to N; thus—



and Q is represented by diverse inclinations of the needles, one of the needles pointing to E, and the other to H, thus—



The following arrangements may facilitate the progress of the learner in acquiring a knowledge of the telegraphic alphabet:—

MOVEMENTS OF THE NEEDLE.

Disc No. 1.

Letter.	Beats to left.	Letter.	Beats to right.
A	2	E	1
B	3	F	2
		G	3
C left to right.		D right to left.	

Disc No. 2.

Letter.	Beats to left.	Letter.	Beats to right.
H	1	N	1
I or J	2	O	2
K	3	P	3
L left to right.		M right to left.	

SIMULTANEOUS MOVEMENTS OF BOTH NEEDLES.

Letter.	Beats to left.	Letter.	Beats to right.
R	1	W	1
S	2	X	2
T	3	Y	3
U left to right.		V right to left.	

The pointing of the needle to +C indicates that the signal or word last completed cannot be interpreted, or was not sufficiently distinct to be read. The technical term for this signal is, "don't understand."

The pointing of the needle to E bears an opposite construction; this latter signal is termed "understand."

One of these movements must occur after each word; in the former case it demands that the signal or word be repeated, and in the latter case that the message be proceeded with.

The period, or full stop (.), is represented by the letters SQ, which would terminate the following sentence.

One self-approving hour whole years outweighs SQ

Another example,

Oh, even from my childhood's hour
I've seen my fondest hopes decay!
I never loved a tree or flower,
But 'twas the first to die;
I never nursed a dear gazelle,
To glad me with its soft black eye,
But when it came to know me well,
And love me, it was sure to die SQ

Inverted commas (" ") are denoted by the letter C occurring in duplicate before and after the word or sentence; hence, in the following example, it should precede the word "thousands," and constitute an annexe to the word "powers."

CC Thousands whom indolence has sent into contemptible obscurity might have come forward to usefulness and honour, if idleness had not frustrated the effect of all their powers. CC

A parenthesis () is indicated by the double P supplying the place of the semicircles which describe it in the ordinary way. Take as illustrations—

The transit of Venus PP by which the distance of the earth from the sun is determined PP can only occur twice in a century, because it is only twice in that time that any number of complete revolutions of Venus are just, or nearly, equal to a certain number of the earth's revolutions.

Ninety-six inches PP or eight feet PP is the utmost height of which we have any authentic record of any living man having attained; and thirty-two inches that of the shortest man, that man not being deformed. The largest horse known is Carter's Mammoth, which is just seventy-eight inches PP nineteen and a half hands PP to the shoulder; the smallest, her Majesty's pet, the Eastern equine pigmy, which is twenty-six inches PP six and a half hands PP. The relative proportions are therefore exact; the giant is three times the height of the dwarf, and the Mammoth horse three times the height of the Eastern pet.

To signify that a sentence has been underlined, the letter L should be signalled in duplicate immediately before and after it. Examples,—

LL *Horses and oxen degenerate and disappear as they approach the frigid zone.* LL

When Eve brought woe to all mankind,
Old Adam called her wo-man;
But when she woo'd with love so kind,
He then pronounced her woo-man;
But now, with folly and with pride,
Their husbands' pockets trimming,
LL *The ladies are so full of whims,* LL
That people call them LL *whim-men.* LL

Amounts, the denominations of which are separated by a stroke, are prefixed by the letters FI, and have the annexe IF. Hence, 46/8 would be signalled thus, FI four six stroke eight IF; and 4/ thus, FI four stroke IF.

No matter of how many syllables or letters a word may consist, the number of beats of each letter must be fully rendered.

As might be inferred, the elementary lesson is the alphabet, and that the learner may pursue his studies uninterruptedly, a "dummy instrument," or an instrument on short circuit (*i. e.* connected with the batteries, but not communicating

with any other station), is placed at his disposal for practice. He may perfect his knowledge of it by getting one of the clerks to signal as he stands near him and reads; and when he deems himself capable of sending a message, however slowly, he may do so upon the line instruments (when not pre-occupied) by arranging with a clerk at one of the other stations to converse upon it with him. He may soon become acquainted with the manipulations necessary for the formation of the several letters, and be able to signal and receive messages by the double needle instrument; no mistake need arise, inasmuch as the instructions given on the discs are sufficient to obviate it.

The messages may be read in the course of transmission at each of the stations in the same circuit, unless the earth-wire be applied to one of the terminals (or metallic knobs, which project from the sides of the instrument).

Switches.

At stations where there are switches the electric current may, by a certain application, be intercepted, and its progress diverted to another course, at the option of the party regulating them.

Transmitting Stations.

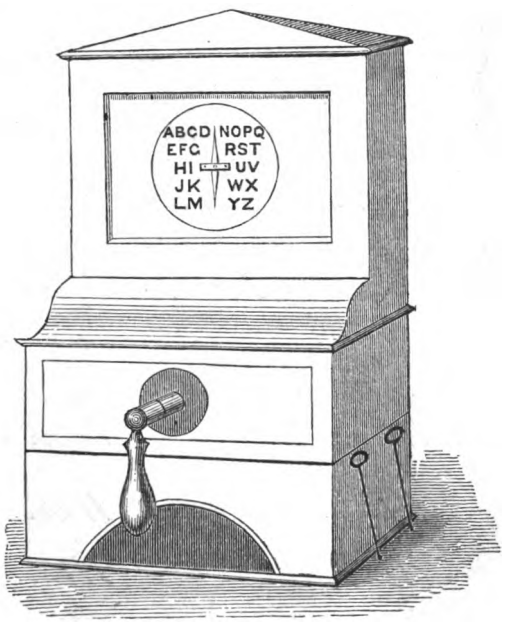
Stations at which there are switches are called "transmitting stations," to which those communications that are destined for stations beyond them must be first telegraphed, and re-signalled or transmitted by the instruments at the transmitting station to the place for which they were originally intended.

Prevention of Interruptions.

As one telegram only can be sent at a time, the stations which are engaged upon it must have the free and uninterrupted occupation of the wires along which it passes; the least interference by another instrument operates to the confusion of the clerks, and the completion of the communication

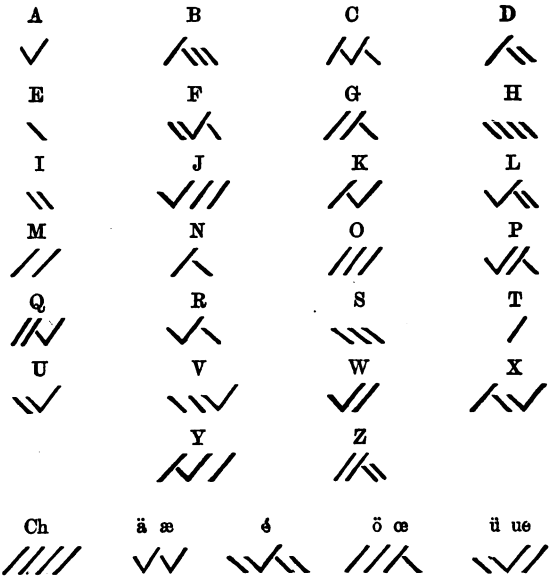
is deferred until the interruption ceases. The prohibition, therefore, of irregularities of this nature, except in extreme or peculiar cases, forms the subject of one of the rules which are framed for the guidance of the clerks. By such, and other like judicious arrangements, telegrams pass and succeed each other with a swiftness that would not only have astonished our forefathers, but which seems almost incredible to the generation of our own time.

THE SINGLE NEEDLE INSTRUMENT.

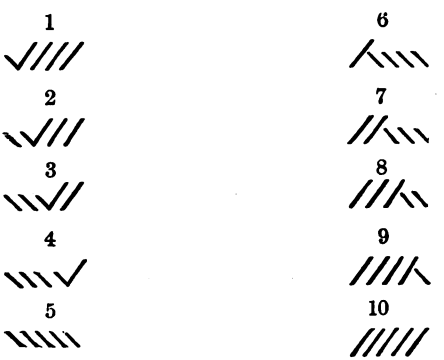


The following characters show the number and inclination of the beats to indicate the respective letters underneath which they are placed:—

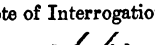
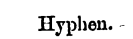
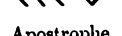
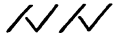
The Alphabet.



Figures.



ANNOTATION.

	Comparative movements of Needle. Letters indicated.
Period, or Full Stop. (.) 	I I I
Comma. (,) 	A A A
Note of Interrogation. (?) 	U D
Inverted Commas. (" ") 	A F
Hyphen. (-) 	B A
Apostrophe. (') 	W G
Parenthesis. ( ) 	K K
Begin with another line. 	A L
Bar of Division. ($\frac{3}{17}$) 	M M M

CONTRACTIONS.

Call Signal.	C K
Understand.* 	T

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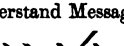
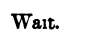
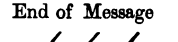
* To be given after each word that is understood.

CONTRACTIONS (*continued*).

	Letters indicated.
Not Understand.* 	E
Understand Message. 	V E
Wait. 	A S
Correction, or rub out 	S S S
End of Message 	A A R
Cleared out, and all right. 	R R R

The termination of a word is indicated by a momentary pause.

It must be understood that the beats for the respective notes, contractions, &c., must be continuous, as though they constituted one letter. The letters of which they are symbolical, are introduced solely for the purpose of impressing upon the memory the inclinations of the needle in representing them.

It will be observed that the number of movements necessary to form a letter by the single needle, exceeds in every instance those required to represent them by the double needle; hence the transmission of a message is accomplished with greater celerity by the latter.

With but few exceptions the inclination of the double

* To be given when the word is not understood.

needle is not varied in the construction of a particular letter; but the single needle is, on the contrary, of diversified tendency, the transition occurring in some instances two or three times. Example,—A is indicated by a movement to the left and then to the right; B by a beat to the right and three in succession to the left; and the other letters are denoted in accordance with the following arrangement:—

Letter.	Beats.				Letter.	Beats.			
	1st.	2nd.	3rd.	4th.		1st.	2nd.	3rd.	4th.
C	right	left	right	left	O	right	right	right	
D	right	left	left		P	left	right	right	left
E	left				Q	right	right	left	right
F	left	left	right	left	R	left	right	left	
G	right	right	left		S	left	left	left	
H	left	left	left	left	T	right			
I	left	left			U	left	left	right	
J	left	right	right	right	V	left	left	left	right
K	right	left	right		W	left	right	right	
L	left	right	left	left	X	right	left	left	right
M	right	right			Y	right	left	right	right
N	right	left			Z	right	right	left	left

In telegraphing numbers, it is customary to enumerate the figures which represent them in successive order, commencing from the left; thus, 10 should be signalled one, nought; 20, as two, nought; 364 as three, six, four; and so on.

THE PRINTING INSTRUMENT.

Telegraph printing is becoming in general use as a rapid and reliable means of communication. The process, which is simple, consists in the clerk at the sending station depressing or raising at pleasure the transmitting key, which influences the action of the style or point of the *morse*, or receiving apparatus, at the receiving station; a dot or stroke, or a succession of each (according to the will of the operator at the

sending station), is impressed upon a strip or ribbon of paper as it passes underneath the style of the morse at the receiving station: these dots and strokes represent the letters of the printing alphabet.

For the information of the scientific inquirer we quote the following from an article, which appeared in the *Electrician*, on the operation of the parts of which the printing instrument consists.

"The 'instrument clerks' have, in the case of lines of any considerable length, four different pieces of apparatus in their charge, viz.:—the galvanometer, the relay-magnet, the receiving instrument, the transmitting key.

"The galvanometer serves to indicate the force of the two currents, from the near and the distant battery, which traverse the wire. It is composed of a piece of magnetised steel, poised horizontally upon a knife edge, and surrounded by a coil of wire. The magnetised steel carries an upright pointer, which shows upon a scale the degree of deflection of the magnet occasioned by the passage of the current through the coil. The latter is compound; there being, in fact, two coils of wire of unequal length, constituting a double galvanometer, the needle of which is influenced to an equal extent by the two currents of unequal power traversing the respective coils. The 'arrival current,' weakened by loss of tension and leakage, passes through the longer coil. By simply inspecting the galvanometer, the *employée* can at any time ascertain the amount of battery power necessary for the transmission of signals, or detect the existence of a 'fault' of sufficient extent to endanger the correctness of transmission.

"The relay-magnet serves to bring into operation a 'local battery' for the purpose of working the receiving instrument; the latter requiring generally a far greater power than could be communicated by the arrival current. This current is therefore made to influence an electro-magnet, the armature of which is adjusted with great delicacy, in close proximity to the poles. When the arrival current traverses the coils of the temporary magnet, the armature is attracted, and its movement causes the powerful current from the local battery to be 'turned on' to the receiving instrument. When the

arrival current is cut off at the distant station, the armature is removed from the temporary magnet by the action of a spring. This, however, applies only to the ordinary system of working lines, in which relays are employed, by a succession of currents in one direction only, or from one pole of the battery. In the system of working by 'reverse currents,' introduced by Mr. C. F. Varley, and employed by the Electric Telegraph Company, the spring is advantageously dispensed with. The relay consists of an electro-magnet, the core of which is moveable inside its helix, the latter being fixed. The core is delicately mounted on pivots, and its extremities play between the poles of fixed permanent magnets of horse-shoe form. When a current is passing through the helix, the iron is temporarily magnetised according to the direction of the current. The one current deflects the iron, and closes the local circuit; the opposite current deflects the iron core in the opposite direction, and opens the local circuit, thus performing the part of the spring in the ordinary relay. The advantage of such an arrangement becomes obvious when it is considered that slight vibrations, or 'accidental currents' along the line, are often sufficient to overcome the resistance of the spring, and thus to produce at the receiving station signals which may seriously interfere with the working of the line. Again, in working by reverse currents, *i. e. in breaking the circuit of the local battery by means of a negative current, instead of by the cessation of the positive current which brings the local battery into operation,* the relay-magnet becomes self-regulating. When a spring is employed for retaining the armature of the electro-magnet, its resistance requires to be constantly re-adjusted, according to the variations in the power of the current, the increased power developed in the magnet by the repeated currents, and the various disturbing influences acting upon the line wire. In the system of reverse currents, the force which retains the armature is always proportionate to that which causes the local circuit to be completed, moreover the former instantly ceases when the latter is brought into operation. Another important advantage of this system is, that from a given number of cells of the battery twice the force is obtained to actuate the relay. Equally important

advantages in the working of long lines are secured in Mr. Varley's system, which, however, do not enter into our present subject matter.

"A simple, but admirable, contrivance is adopted for preventing the vibration of the delicate relay magnets. A heavy rectangular mass of iron is enclosed in a wooden box, mounted upon supports of vulcanised caoutchouc. Upon this the instrument is placed; and, by reason of the difficulty of producing vibrations in a heavy mass supported upon an elastic material, it is thus withdrawn from such disturbing influences.

"The receiving instrument used with the relay on long circuits, and occasionally worked on shorter circuits by the current from the distant station, is that which is generally known as the morse instrument, but has undergone some modification at the hands of the engineer and electrician to the Company. The signals are produced by the action of an electro-magnet, the armature of which carries a lever, one end of which, when the armature is attracted by the magnet, impresses the 'dots and dashes' upon a long strip of paper moved through the instrument by the agency of clock-work. From this strip the message is transcribed in writing.

"The lever-key is a very simple piece of apparatus for transmitting a succession of currents along the line. The signals are sent by depressing one end of a brass lever, either by a momentary pressure producing a 'dot' upon the paper slip at the distant station, or for a short space of time, in which case the 'dash' is impressed. In its normal position, the lever obeys the influence of a spring, and establishes the communication between the line wire and the relay or receiving instrument. When depressed, the key brings the line wire into communication with one of the poles of the battery. In Mr. Varley's system of transmission, the lever, when released, establishes a momentary communication between the line wire and the earth, in order to facilitate the discharge of the wire, and also causes a reverse current to be transmitted."

The Alphabet.

A ·—	B —···	C —·—·	D —··
E ·	F ··—·	G ——·	H ····
I ··	J ·———	K —·—	L ·—··
M ——	N —·	O ———	P ·——·
Q ——·—	R ·—·	S ···	T —
U ··—	V ···—	W ·——	X —··—
	Y —·——	Z ——··	

Ch ————	ä æ ·—·—	é ··—··	ö œ ———·	ü ue ··——

Numerals.

1 ·————	6 —····
2 ··———	7 ——···
3 ···——	8 ———··
4 ····—	9 ————·
5 ·····	0 —————

ANNOTATION.

	Letters indicated.
Period, or Full Stop. ------	I I I
Comma. .—.—.—	A A A
Note of Interrogation. ..——..	U D
Inverted Commas. .—..—.	A F
Hyphen. — ....—	B A
Apostrophe. .————.-	W G
Parenthesis. —.——.—	K K
Begin with another line. .—.—..	A L
Bar of Division. ———————	M M M

CONTRACTIONS.

Call Signal. ..—.—.—	C K
Understand Message. ...—.	V E
Wait. .—...	A S
Correction, or rub out.	S S S
End of Message. .—.—.—.	A A R
Cleared out, and all right. .—.—.—.—.	R R R

Exercises in Punctuation, &c.

Period, Colon, and Semicolon :—

Night brings out stars, as sorrows show us truth - - - - - -

Various instances are recorded in ancient works of electricity having been given off from the hair, and other parts of the human body- - - - - -

Virgil makes mention of a harmless fire which was emitted from the hair of Ascanius - - - - - - Whether this was so or not is uncertain, as doubts even of the existence of such a person as Ascanius have been raised - - - - - -

Comma :—

Iceland spar - — - - - — on being subjected to pressure in certain directions - — - - - — shows evident symptoms of electric action - — - - - — and affects the galvanoscope accordingly.

Note of Interrogation :—

The slightest flap a fly will chase,
But who can drive the numerous breed - - — — - -
Chase one, another will succeed.

Mr. Highton remarks that however difficult it is found in practice for man to transmit, artificially, currents of electricity from any kind of electric apparatus wholly submersed in water, yet Nature, in her sublime workings, finds no difficulty whatever in so doing. The philosopher is thus invited to careful study and deep investigation. The day may come when this mode of action in the animal kingdom will be better understood than it is now; and then, probably, will be discovered a means of constructing submarine telegraphs, without any insulation of the wires; and who shall say whether such a discovery would not satisfactorily solve the problem of communicating instantaneously between Great Britain and America - - — — - -

Inverted Commas :—

- — - - - - The world of science is not agreed as to the physical character of electricity. According to the opinion of some, it is a fluid infinitely lighter and more subtle than the most attenuated and impalpable gas, capable of moving through space with a velocity commensurate with its subtleness and levity. Some regard this fluid as simple. Others contend that it is compound, consisting of two simple fluids bearing antagonistic properties, which, when in combination, neutralise each other, but which recover their activity by decomposition. Others, again, regard it not as a specific fluid which moves through space, but as a phenomenon analagous to sound, and think that it is only a series of undulations or vibrations, that are propagated through a highly elastic

medium, which produce the various electrical effects, just as the pulsations of the atmosphere produce all the effects of sound. - — - - — -

- — - - — - I love to linger on the track,
Wherever I have dwelt;
In after years to loiter back,
And feel as I have felt.
Old places have a charm for me
The new can ne'er attain;
Old faces—how I long to see
Their kindly looks again. - — - - — -

Hyphen :—

The atmosphere is that transparent, elastic, and invisible fluid which encompasses the earth on all sides, to the height of about forty — - - - - — five miles.

The electric fluid is evolved by the combination of three bodies, the zinc, the copper, and the acidulated solution in which they are immersed. The production of the current depends on the chemical action of the solution of the zinc: that metal, being very susceptible of oxidation, decomposes the water which is in contact with it. One constituent of the water combining with the zinc produces a compound called the oxide of zinc; and this oxide entering again into combination with the acid which the water holds in solution, forms a soluble salt. If the acid, for example, be sulphuric — - - - - — acid, this salt will be the sulphate of the oxide of zinc; and as fast as it is produced it will be dissolved in the water in which the slips of metal are immersed. Meanwhile, the copper not being as susceptible of chemical action as the zinc, remains comparatively unaffected by the solution; but the hydrogen evolved in the decomposition of the water collects upon its surface, after which it rises and escapes in bubbles at the surface of the solution. It is to this chemical action upon the zinc that the production of the electric current is due. — - - - - — *Lardner.*

Apostrophe :—

Look around,
And tell me, shall we to blind chance ascribe
The scene so wonderful, so fair, so good?
Shall we no farther search than sense will lead,
To find the glorious Cause which so delights
The eye and ear, and scatters ev - — — — — - rywhere
Ambrosial perfumes?

In some states of the weather, and in certain fogs, an insulated rod extending high into the atmosphere, with a range of exploring wire attach - — — — — - d to it, will bring down torrents of the electric fluid. It is a remarkable fact, too, that the power within a few minutes changes from positive to negative, and *vice versâ* from negative to positive.

Parenthesis :—

Setting aside those magnificent natural displays of the electric action — - — — - — the thunder-storm and aurora borealis — - — — - — not a cloud passes over our heads but the electric equilibrium of the earth below is affected thereby.

Begin another line :—

To produce the effects, whatever these may be, by which the telegraphic messages are expressed, it is necessary that the electric current shall have a certain intensity. Now the intensity of the current transmitted by a given voltaic battery, along a given line of wire, will decrease, other things being the same, in the same proportion as the length of the wire increases. Thus, if the wire be continued for ten miles, the current will have twice the intensity which it would have if the wire had been extended to a distance of twenty miles. - — - — - -

It is evident, therefore, that the wire may be continued to such a length that the current will no longer have sufficient intensity to produce at the station to which the despatch is transmitted those effects by which the language of the despatch is signified. - — - — - -

The intensity of the current transmitted by a given voltaic battery upon a wire of given length, will be increased in the same proportion as the area of the section of the wire is augmented. Thus, if the diameter of the wire be doubled, the area of its section being increased in a fourfold proportion, the intensity of the current transmitted along the wire will be increased in the same ratio.—*Lardner.*

Some in their age - — - — - -
Ripe for the sickle; others young like him,
And falling green beneath th' untimely stroke.

The student should note that the formation of a letter does not depend exclusively upon the number of dots and strokes—their position has also to be considered; as, in some cases, the characters are, by variation of place, made to express a plurality of letters. Examples,—a dot and stroke (the former preceding the latter) constitute the letter A; but reverse their position, and the combination will represent N. In like manner D and U are indicated by two dots and a stroke, but not concurrently disposed; G and W have also a kindred number of marks, but differently arranged; and similar remarks will apply to B and V, and to Q and Y. The dots and strokes are indented by the same style or printing instrument, the difference in the length being influenced by the continuance or otherwise of the pressure of the finger upon the transmitting key.

The learner may easily, indeed almost imperceptibly, attain to a proficiency in reading the printing alphabet, by committing to writing as he reduces from one character of letter to another, as illustrated below :—

To the TELEGRAPH COMPANY.

Please telegraph the following Message

From

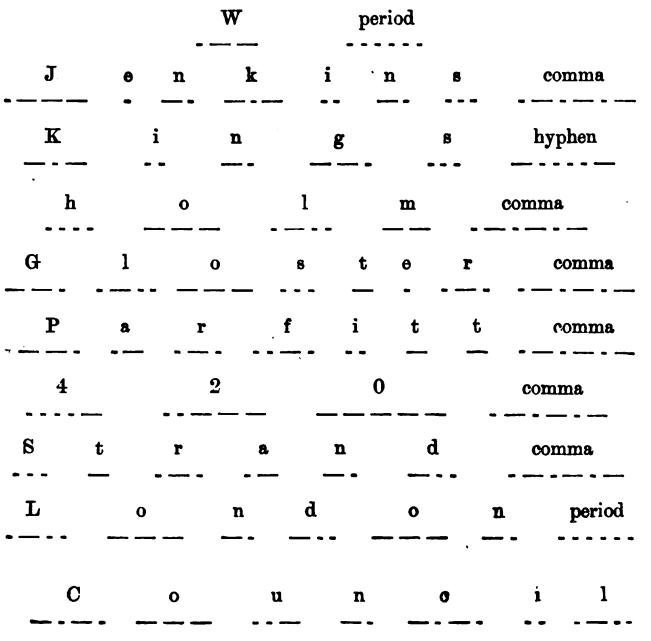
W. JENKINS, Kings-holm, Gloster,

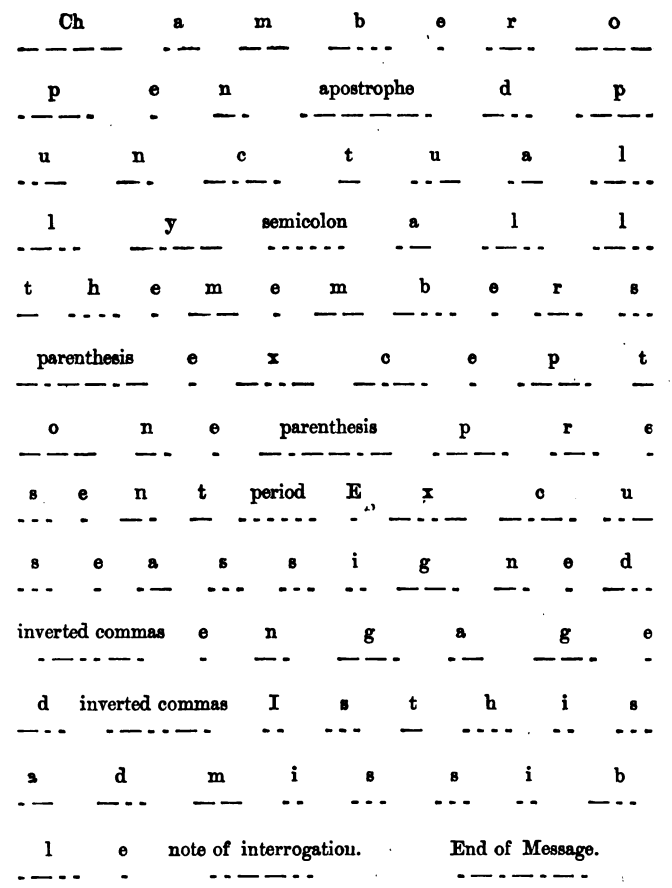
To

PARFITT, 420, Strand, London.

Council Chamber open'd punctually; all the members (except one) present. Excuse assigned—"engaged." Is this admissible?

EXERCISE.





It should be observed, that messages issuing from the morse, or telegraph printing press, appear on the moveable strip, or paper ribbon, in one line in continuous order.

CODES, ETC.

In telegraphing there are various abbreviations, denominated *codes*, which are significant of instructions, time, names of stations, &c. These codes have their peculiar positions, some occupying the precedence in the telegram, whilst others of them are intermedials, and some again form the termination. The codes included in the category of the former are called *prefixes*, and those in that of the two latter come under the term *affixes*. These codes may be severally defined as the signification of few or many words by one or two letters, and when constituted as signals are momentarily recognised, as but a few beats, or even a single beat, are indicative of a meaning, the full rendering of which would occupy more time, and not be so readily understood. All companies do not employ precisely the same letters to express a similar signification, but the difference is not material. The following list embraces those of most general adoption.

Prefixes.

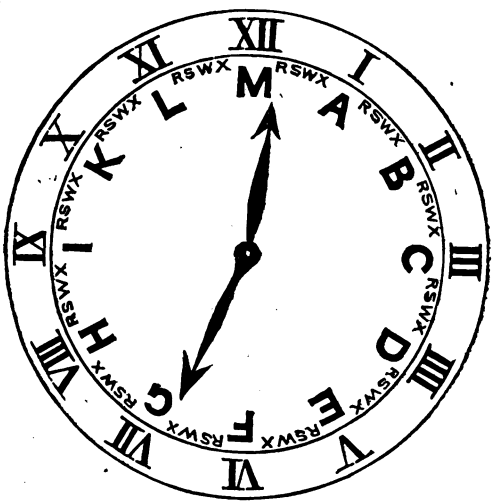
Prefixes.	Their Signification.
A . .	Free Message.
A S . .	Special Express. Telegrams with this prefix have reference to the closing prices of the funds and shares, and alteration in the rates of discount, and are next in order of precedence to government despatches.
B D . .	Government Despatches. All messages emanating from the Royal Family and from her Majesty's Ministers are thus described. They have accorded to them a priority over all other messages, except those of an urgent nature which are issued by the directors, or by the engineers' department.
C B . .	Chairman's, or Special Service Despatch: is issued by the chairman of the directors, or some one whom he may depute. All other telegrams, no matter by whom issued or on what business, must yield the precedence to this one. If a message should be in the course of transmission, its completion must be deferred until the C B has been despatched.
D . .	Duplicate Telegram. If the recipient of a telegram is doubtful as to its accuracy, and should give instructions

Prefixes.	Their Signification.
	for it to be repeated, the application and its reply would bear this prefix. It is customary, if the original signalling is found correct, for half of the original charge to be made for the duplicate; but if it be ascertained that the company's clerk is in error, the extra service is performed free of charge.
D B . .	Ordinary Railway Message.
D G . .	Danger Signal. This code is used for railway messages only, and has assigned to it the precedence in that class of telegrams. The despatches prefixed by it have reference to accidents, or contain instructions for the prevention of them. Railway superintendents and their representatives only authorise the transmission of them.
D L . .	For Ordinary Transmitted Messages, *i.e.* telegrams which are forwarded to an intermediate station for transmission to the station for which they are destined.
D S . .	Engineer's Despatch. Messages prefaced by this code have the precedence next in order to the chairman's. Such messages relate to the occupancy of the wires, &c., for repairs or other purposes, by the staff of the engineers' department, members of which only are empowered to use it, except when clerks in charge have special communications to make to the engineer or secretary.
G . .	Urgent. This prefix is employed when repetitions of important telegrams are required for the satisfaction of the officers of the company.
I . .	Insured.
R . .	Repeated.
R Q . .	Repeated Railway Despatch.
S . .	Ordinary Private Message. When there are no telegrams bearing the extraordinary prefixes, the transmission of telegrams of this code must be regulated by the time delivered to the company, the earliest having the precedence.
S P . .	Special Railway Message. This despatch has the precedence of other railway messages, if there is no D G.
T A . .	Train Reports: used in signalling the arrival and departure of trains.

Prefixes.	Their Signification.
U . .	On Company's Service: Ordinary Message. To be forwarded when the wires are not engaged with other communications.
X . .	Private Transmitted Message.
X S . .	Special Railway Message to be transmitted: when a special message is forwarded to a station short of its destination, to be transmitted thence to it; thus, if the despatch be telegraphed by Chepstow to Gloucester for London, this prefix should be given to Gloucester, and that station would signal (or transmit) it to London.
G R . .	Gloucester.
N P . .	Newport. *And so on.*

Time Codes.

These are also prefixes, and are as shown on the diagram below. The large letters represent the hours and the



twelve divisions of the hour, and the four smaller letters are expressive of from one to four minutes.

A	denotes the	1st	hour, or	5	minutes.
B	„	2nd	„	10	„
C	„	3rd	„	15	„
D	„	4th	„	20	„
E	„	5th	„	25	„
F	„	6th	„	30	„
G	„	7th	„	35	„
H	„	8th	„	40	„
I	„	9th	„	45	„
K	„	10th	„	50	„
L	„	11th	„	55	„
M	„	12th			

R	is significant of	1	minute.
S	„	2	„
W	„	3	„
X	„	4	„

It is sometimes necessary to employ a combination of these letters in a code, for example:—

		H.	M.
A B	would signify	1	10
B A	„ „	2	5
B A S	„ „	2	7
B A W	„ „	2	8
B A X	„ „	2	9
D F	„ „	4	30
G R	„ „	7	1
G G	„ „	7	35
K L	„ „	10	55
M R	„ „	12	1

And so on.

AFFIXES.

Affixes.	Their Signification.
A P . .	Acknowledgment paid for. Used for Continental despatches.
A U . .	Answer not paid for. Reply to be returned by messenger.

Affixes.	Their Signification.
B B . .	Telegram to be forwarded by boat from the station at which received.
B C . .	Telegram to be forwarded by cab or fly.
B M . .	Telegram to be forwarded by best means.
B O . .	Telegram to be forwarded by omnibus or coach.
B T . .	Telegram to be forwarded by train, or transmitted by another company's telegraph.
C F . .	Telegram to be called for.
D Q . .	Completion of address, and should occur next in order to the address of receiver.
F T . .	By First Train.
G D . .	Right, or Good. This code is given by the receiving clerk after he has counted the words, and satisfied himself that the number is correct. He will then release the handle (which he had held, with needle pointed in the direction of E, from the time the sending clerk signalled the code P Q).
K Q . .	This code does not occur in the message. It indicates that you are engaged, and will notify to the clerk who may be "calling" your station when you can attend to him.
M C . .	Despatch to be taken in a cab, if within a distance of three miles, by messenger attached to the company.
M H . .	Despatch to be conveyed by man on horseback.
M M . .	This code is intended to precede all others, having reference to the disposal or forwarding of a telegram, and must occur immediately after the completion of the body of the message; when special instructions are not given it is not employed. It implies "Instructions," and is represented thus ——
M Q . .	This code does not occur in the telegram, but is simply a request to the station "calling" yours to wait, you being otherwise engaged.
P Q . .	Termination of Message; represented in writing thus ==
P U . .	Porterage not prepaid by sender.
R C . .	Telegram to be forwarded by most rapid conveyance, expense being no consideration.
S X . .	To be forwarded by special express, the distance not exceeding three miles.

Abbrev.	Their Signification.
T P . .	Telegram to be posted.
W . .	Is a notification to the clerk to whom the codes K Q or M Q were signalled, that his communication may be commenced, or proceeded with.
W P . .	Reply paid for by sender.

FORMS, ETC.

Telegraph companies have certain forms which embody the conditions subject to which they undertake the forwarding of despatches. On these the public are expected to write their messages, and to subscribe their names.

The Forwarding Note.

Progressive No. of Message, 1.

Code of Sending Station, C P.

Date, 18 .

Charges for—	Amount. Stamp.
Message	
Repeating	
Reply	
Forwarding Charges	
Porterage	
Total	

Prefix, S. Station forwarded to, B S.
Code time, K F. Time of receipt of Message . . . 10·30 a.m.
Number of words, 19. Time signalled . 10·40 „
(D Q, M M) (Address 12) (7) (M M, P Q)
Signature of Counter Clerk,

To the Telegraph Company.

Please telegraph the following*
message, subject to the conditions indorsed hereon, and forward the same from the terminal station of the above Company at
by to address.

From

R. Jones, Chepstow

To

John Williams, Packet-office, Bristol.

D Q

I shall be in Bristol to-morrow morning. Please endeavour to meet me

Signature, R. Jones,

St. Mary Street, Chepstow.

* State here if the message be insured or otherwise.

The only portion of the preceding form which the sender supplies is the "message," commencing after the word "from." The codes, time, and number of words are inserted by the clerk, and, with the exception of the time when the forwarding of the message was completed, must be supplemented before the signalling is commenced.

The telegrams must be numbered consecutively in the order in which they are received from the public, commencing at No. 1, either weekly, half weekly, or fortnightly, according to the appointed time of rendering the abstract in which they are included; hence, if the abstract ends this day, a new series of progressive numbers will commence with the first of to-morrow's messages, and the numbers of subsequent telegrams extending over the period to which the abstract has reference will be in consecutive order, the last number completing the series. We will assume the above example to be the first telegram of the current week, and therefore number it accordingly—then, Chepstow being the sending station, we insert the code CP, which is as well understood among telegraph employés as though the name of the station was rendered in full.

Entries of Charges.—In the charge column should be entered, at the time of receipt, the amount paid for the message, as well as for incidental expenses, if any. Some companies issue adhesive stamps, charging for them at rates varying from 3*d.* each, and upwards; and when one, or a certain number, according to the ordinary charge, is affixed to the form, the word "stamp" must be written across the cash columns; but in the event of the stamps which are affixed not representing the full amount of charge, the difference has to be obtained from the sender, and inserted.

The next addition is the *message prefix*, which, the despatch being an ordinary private one, is S. Then follows the

Code of Station for which the message is destined, and which is in this case BS, for Bristol. We now enter the

Time Code, which implies the time of delivery to the company by the sender: 10·30 being the time selected in this illustration, K F must appear as the code.

Number of Words.—The number of words comprises those constituting the address, message, and instructions. The classified components of the total number of words are detailed immediately underneath, as number of words in message, number in address, and number contained in the instructions having reference to the delivery.

The necessary preparations for the commencement of operations being now matured, the message must be hung in front of the instrument, in order that it may be read by the clerk as he signals it, word by word, and letter by letter.

The "Call" Signal.

Formerly, it was the practice to attract the attention of a station by an alarum, when a message was to be forwarded; but, whether from the fact of its being too clamorous, or from another cause, that mode of call has grown into desuetude, and the less noisy one of working the needles a few times backwards and forwards, is substituted for it.

Printing Instrument "Call."

With the printing instrument, the call signal — - — - — - — should be repeated three times; then should be signalled the code of the station for which the message is intended, with the letter V, and code of your own station. In the above example, the order should be thus: BS, V, CP, and that station (Bristol) would reply "BS here." Then proceed as with needles.

Order of Telegraphing.

After the call, indicate the name of station to which you have to telegraph the message, by signalling the code, which in this case would be BS, and the receiving station must repeat it. You have then to give the code of your own station, which (assuming it to be Chepstow) would be CP, and the receiving station must repeat that also. This is followed by

your signalling the message prefix S, then the time code, and after that the number of words, the name and address of parties from and to, and then D Q. The message itself has to succeed the latter code; and, upon its completion, the affix AAR must be given, unless there are special instructions having reference to the delivery of the message, when the affix MM must occur immediately after the last word of the message—then the instructions, followed by the affix AAR.

The various despatches must be signalled in order, according to priority of time, or message code.

Interruptions, Authorised and Otherwise.

It is only in the case of time, or precedence of message prefix, that interruptions are sanctioned, and not then, as regards time only, when a message is in course of transmission, but simply immediately after the time code has been signalled; hence, if it be observed by a clerk that a time code, which is later than his own, has been given, he may interrupt by the "wait" code, and the occupancy of the instrument must be relinquished to him. He will then proceed in the order as explained above.

All interruptions to the free transmission of telegrams are recorded and reported to the district superintendent, with a full explanation of their nature, accompanied by suggestions, if necessary, to obviate their recurrence. If the duration of the impediment exceeds half an hour, a report of it has to be made at the time, by wire, to the superintendent.

Rule to be Observed in Counting.

Words included in parentheses or inverted commas, as well as those which are underlined, are counted as two each; but hyphens, and combinations effected by them—thus, *to-day* —are treated collectively as one word only. Numbers, sums, and dates may be telegraphed in figures, or spelt as written in the telegram, each figure being counted as a word. In cypher messages each syllable is reckoned as a word.

Collating, or Repeating Back.

To insure accuracy in the transmission and receipt of messages, it is customary for the receiving station to signal back, or, in telegraph phrase, *collate* all words and figures of doubtful import, and for the sending clerk to insert the mark O, and the receiving clerk the mark + underneath the collated or repeated words. If it be a printing instrument message to which the collature has reference, the progressive number of the message is to be signalled back, and after it the figure, or doubtful word, and the note of interrogation; and if emendation be needed, the sending clerk will signal the corrected word, &c., but if the original sending was perfect, he will telegraph the "all right" signal, R R R.

In the case of a single or double needle instrument, G D (*i.e.* correct) must be returned by the sending clerk, in reply to the collating by the receiver of the doubtful expression; but if correction be needed, he will telegraph accordingly.

The mode of drawing the attention of the sending clerk to a supposed error, is for the receiving clerk to work the needles backwards and forwards two or three times, and signal the code PE (which is synonymous to the words "repeat from"), followed by the word preceding the doubtful one. Suppose, for example, the message to run thus: "Can you come here this evening," and the receiving clerk is uncertain as to, or cannot understand, the third word, his duty is to give the code "P E you," and the sending station will supply the word "come," and then proceed with the other portion.

In the event of a doubt arising as to the correctness of a word, after the completion of a telegram, the receiving clerk must signal the code W A (which signifies "word after") or W B (which means "word before"); hence, in the same example, the question would be asked thus—"W A you," or it might be "W B here;" but where a plurality of words require to be repeated, the receiving clerk would preface the preceding and succeeding words by P F (which implies "repeat from——to——"); consequently if the portion of

the example "here this" has to be repeated, he would telegraph "P F come, evening."

If, after the receipt of a telegram, the receiving clerk should upon computing find that there is a discrepancy in the number of words, he must give the code R Q, or what other may be peculiar to his company, followed by the word "only," to which he would add the number of words as calculated by him, which, for example, we will assume to be 24, and that the statement of the sending clerk shows 26. We will also assume the former number to consist of 18 words in the message and 6 in the addresses; the receiving clerk should therefore telegraph "R Q, only 24-6 to D Q"—it will thus be momentarily discovered whether the error is in the addresses or in the body of the message, and that in which it may occur must be repeated.

Delivery Form.

On this sheet the inwards clerk has to write the messages received by him, for delivery to the parties for whom they are intended.

The Telegraph Company.

Date, 18 .

Charges to receive—	£	s.	d.
Message			
Porterage.....		Nil	
Cab hire			
Total.....			

The following telegram received at Bristol Station from Chepstow Station :—

From { R. Jones, Chepstow, } *To* { John Williams, Packet-office, Bristol. }

I shall be in Bristol to-morrow morning. Please endeavour to meet me.

Clerk.

Receipt of Message Ticket.

The delivery form should be accompanied by a "delivery note," which must be signed in acknowledgment of receipt of telegram, by the party to whom it is delivered; such document including time, name of messenger, &c.

To the Telegraph Company
Date, 18 .

Telegram for Mr. John Williams.

Delivered by me, T. Davies, *Messenger.*

	£ s. d.		£ s. d.
Amount, if any, deposited for reply	Nil	To pay— Excess on Message..... Porterage	Nil
		Total.....	

Time of delivery of Message, 10·50 a.m.

Signature of Receiver, John Williams.

Advice Note.

If the delivery of a despatch cannot be effected, an "advice note" must be left at the address for which it is intended.

The Telegraph Company.
Bristol Station,
Date, 18 .

A Telegram waits for Mr. John Williams at this Company's office.

Transmitted Messages.

The following is illustrative of a message to be transmitted, *i.e.* to be forwarded to a certain station, and thence transmitted to its destination by another telegraph, or to another station on the same line. In this example it will be observed

that the message is for a place which is beyond the original company's limits. The ordinary "forwarded note" will be used in this case.

Progressive No. of Message, 2

Code of Sending Station, N P.

Date, 18 .

Charges for—	Amount. £	s.	d.
Message		5	0
Repeating			
Reply			
Forwarding charges		2	6
Porterage			
Total		7	6

Prefix, X.
Code time, K L.
Number of words, 19.

Station forwarded to, K R
Time of receipt of Message ..... 10·55 a.m.
Time signalled..... 11·0 „

(D Q, M M 6) (Address 10) (M M, P Q 3)

Signature of Counter Clerk,

To the Telegraph Company.

Please telegraph the following* message, subject to the conditions indorsed hereon, and forward the same from the terminal station of the above company at Dublin, by Magnetic Telegraph, to address.

From

THOMAS JENKINS, Newport.

To

PATRICK O'DONAGHUE, 25, Ritson Place, Cork.

D Q

I am very ill. Come immediately.

B T, Dublin.

Signature, THOMAS JENKINS,
Maindee, Newport.

MESSAGES NOT WRITTEN ON THE COMPANY'S FORM.

It may so happen that a telegram be sent to a telegraph office written on plain paper, instead of on the usual printed form, and in such case, the sender or his representative must subscribe to the same conditions as those which are published on the ordinary "forwarded note." Those printed conditions are prefaced by the codes, and other particulars, as

* State here if the message be insured, or otherwise.

supplemented by the clerk on the "forwarded note;" underneath these must appear the names and addresses of the parties from and to; and the signature of the sender must be attached at foot.

Indemnification Form.

When telegrams affect the reputation or interest of individuals or companies, the sending party must append his signature to a special agreement, or "indemnification form" which is of the following purport:—

To the Telegraph Company.

I hereby agree to relieve from responsibility, and indemnify the above Company and their agents from any loss or expense that may be occasioned by the transmission of the telegram bearing date 18 .

From William Thomas, Queen Street, Dursley,

To Giles Scrubbs, Cork Road, Manchester.

Signature, William Thomas, Queen Street, Dursley.

Witness, R. Ward.

The Funds and Share List.

This requires no explanation.

The Telegraph Company.

Date, 18 .

Consols for Money	———
„ Account	———
3 per Cents.	———
Bank Stock	———
Exchequer Bills, large	———
„ „ small	———
Buckinghamshire	———
Caledonian	———
„ Preference	———
Eastern Counties	———

Great Northern ..... _____
„ „ A ..... _____
„ „ B ..... _____
Great Western ..... _____
Midland ..... _____
North Western ..... _____
South Wales ..... _____
West Midland ..... _____

Turkish Sixes ..... _____
„ Fours ..... _____

THE NUMBER SHEET.

This register is employed as an assistance to the memory of the clerk.

One or more of these forms serve for one day. The lines in each division are numbered in succession from 1 to 100.

FORWARDED.						RECEIVED.					
Time.	No.	Tick.	Time.	No.	Tick.	Time.	Tick.	No.	Time.	Tick.	No.
10·30	1	✓		20		6·0	✓	1			20
12·0	2	✓		21		6·50	✓	2			21
4·0	3			22		7·0		3			22
4·30	4			23		8·30		4			23
	5			24		8·45		5			24
	6			25				6			25
	7			26				7			26
	8			27				8			27
	9			28				9			28
	10			29				10			29
	11			30				11			30
	12			31				12			31
	13			32				13			32
	14			33				14			33
	15			34				15			34
	16			35				16			35
	17			36				17			36
	18			37				18			37
	19			38				19			38

The time must be inserted opposite the figures corresponding with the progressive numbers of the "forwarded" and "received" forms. In the case of the former, a tick must be placed to the right of such figures upon the completion of the message to which they bear reference; but in that of the latter, the tick should be entered to the left, as the message to which it relates is handed to the messenger for delivery.

This list is referred to every half-hour.

INSTRUCTIONS FOR DELIVERY OF A TELEGRAM TO A DIFFERENT ADDRESS TO THAT GIVEN BY THE SENDER.

Station,

Date, 18 .

To the Telegraph Company.

The telegraphic despatch from JOHN JONES, Stroud, to WILLIAM THOMAS, Swansea, you will please deliver to me, WILLIAM SELBY, Dock Hotel, Swansea, instead of at the address given by sender; and I hereby undertake to relieve the Telegraph Company from all responsibility for any consequences that may arise from the omission to comply with these instructions, and from all consequences arising from their non-compliance with the original instructions as furnished to the Company by the sender of the message.

Signature of Receiver, WILLIAM SELBY,

Dublin Street, Cork.

Witness, *Clerk in Charge.*

Unless the party making the application is prepared with documents of identification (in the absence of a knowledge of him by the clerk in charge), and can give the full names and addresses, with other information as to subject referred to, his request must not be complied with.

Regulations affecting those Messages which cannot be Delivered within a prescribed Period.

It may happen that, from some cause or other, a telegram cannot be delivered within four days after its receipt. It is therefore usual, at the expiration of that period, to send it, together with the envelope in which it may be enclosed, and messenger's ticket, to the clearing house.

Abstracts.

These are transcripts of the abstract books, and are rendered to the chief office either monthly, fortnightly, weekly, or half weekly.

Abstract Books.

Messages should, at the period of sending or receiving, be registered in the *Inwards* or *Outwards Abstract Book*, as the case may be. The accompanying examples are intended to exhibit the monthly account, with the introduction of the half-weekly totals. It is customary to "rule off" daily, to cast up the amounts which appear in the respective columns as components of the day's receipts, &c., and to insert the totals immediately below the line which occurs after the closing entries.

When the abstracts have to be rendered half-weekly, the totals of the first four days should be added together, and the aggregate shown; and on the conclusion of the week's business, the totals of the last three days' amounts must be ascertained, and added to the totals of the former portion of the week, thus—

Totals of 2nd half week..... „ „
„ 1st „ ..... „ „

	i	The
		j
M	To	Number of words chargeable.
	Brown	43
	Bird	...
	Slidell	20
	Persigny	...
	Box	...
	Napoleon	...
	Martin	...
r	Budd	...
a po	rterage	...
	Jones	...
off	Cambridge	...
ick	Royal	...
	Matthew	48
	Nashville	...
all	Knowles	...
	Jordan	...
nts	Lloyd	...
	Jones	...
	Marsh	...
	Bird	...
	Cairn	...
n	Slidell	...
ams	Trent	...
os	Lincoln	...

R is the code for Card

EXPLANATIONS OF COLUMNS IN FORWARDED MESSAGES ABSTRACT BOOK.

b Is intended for the numbers which are inserted in progressive order on the telegrams as they are received by the counter clerk. It will be observed that a fresh series of numbers commences with each return, which in this case embraces a period of half a week.

c Contains the exact time of receipt of message from sender by the counter clerk.

d Time of completion of message; or, in other words, the time at which the signalling of the message is finished.

e Name and place of address of party for whom the telegram is intended.

f Name of station to which telegraphed by you.

g Last station of your company through which the message passes.

h Name of sender of message.

i Name of receiver of message.

The next ten columns are devoted to particulars having reference to the company's adhesive stamps which are sold to the public. These stamps are numbered progressively, and represent certain amounts, and when affixed to the message are, of course equivalent to cash. The first of these column

j Should contain the number of words, exclusive of address and instructions.

k Here should appear the value of the stamp affixed.

l These six succeeding columns are devoted to the numbers borne by the stamps, which should be entered under one or more of the amounts which would correspond in total with the sum to which they refer in column *j*; hence, for the first message (a 5*s.* one), Jones to Brown, two stamps (a 1*s.* and a 4*s.* one) have to be used; one of which, the 1*s.* one, we will assume to be numbered 3,211, and the 4*s.* stamp, 8,954; the former number should therefore appear in the column headed 1*s.*, and the latter in that headed 4*s.*

m When the stamps do not represent the full amount of the company's charge (*vide* first message in the above account), the amount of money unpaid by them must appear in this column.

n The charges made for telegraphing include for delivery to within certain limits; but beyond them an additional amount is required for the extra service; and such amounts, when applying to stamped messages, must be entered in this column.

o and *p*. The company's actual earnings, as received in cash, for telegraphing, are included in these two columns. In the former should appear the amounts relating to messages forwarded; and in the latter the sums which are prepaid for replies. To column *p* are transferred the amounts which appear in column *m* of the "Inwards" or "Received Message" Book.

q Porterage paid by public for delivery by company's messenger beyond the free limits.

r The amounts entered here are those which are paid out to special messengers.

s Parties sending messages by other telegraphs having communication with yours, prepay for the whole distance; and the "foreign" company's proportion of the charge must appear in this column.

t Gratuities. When the public require a clerk to remain on duty beyond the prescribed time, they must remunerate him for so doing; the amounts thus received are termed "gratuities," and must be entered in this column.

u Contains the full amounts received on account of each message.

v Contains the half-weekly totals.

w The Post-office and Railway authorities, and others, use what are denominated "franked message papers"—the initials of the company or department must be inserted in this column; as, for instance, P.O. for Post-office, G.W.R. for Great Western Railway, &c.

a	*b*	*c*	*d*	*e*	...TTED MESSAGES. *s*
Date of Telegram.	Consecutive No. of Telegram.	Consecutive No. of transmitted Telegram.	Time Code.	Time received at this Station.	Time forwarded
Jan. 1			Nil		
„ 2			Nil		
„ 3	1		9·40 a.m.	9·50 a.m.	
„ 4	2		1·10 p.m.	1·12 p.m.	
„ 5			Nil		
„ 6			Nil		
„ 7			Nil		
„ 8			Nil		
„ 9			Nil		
„ 10			Nil		
„ 11			Nil		
„ 12			Nil		
„ 13	1		7·10 p.m.	7·20 p.m.	
„ 14			Nil		
„ 15			Nil		
„ 16			Nil		
„ 17			Nil		
„ 18			Nil		
„ 19			Nil		
„ 20	1		11·10 a.m.	11·12 a.m.	
	2		11·18 „	11·20 „	
„ 21			Nil		
„ 22			Nil		
„ 23			Nil		
„ 24			Nil		
„ 25	1		12·15 p.m.	12·20 p.m.	
„ 26			Nil		
„ 27			Nil		
„ 28			Nil		

...n II., to face p. 53

Explanation of Columns in Inwards, or Received Messages. Abstract Book.

b Consecutive number of telegrams received for this station.

c Consecutive number of telegrams received at this station to be transmitted hence to another.

d Time received from sender at counter of outwards station.

e Time at which the telegraphing the message to this station was completed.

N.B.—In some abstract books a column is introduced for extent of delays over ten minutes.

f and *g* The headings fully explain the use of these.

h Code of outwards, or station from which the message was originally despatched.

i Code of station from which the message has been received by this one. If the message should not be a transmitted one, the code would be a repetition of that one occurring in column *b*.

l and *m* For actual earnings of this company. The amount received for replies not paid for by sender of original message, must be entered in column *m*, and likewise in the Outwards Abstract, as it is through the latter that it has to be debited to the station at which paid.

n and *o* Explained fully in the headings.

p When the porterage is paid for by the receiver, the amount must be entered here, and transcribed in the Outwards Abstract.

p This column is appropriated to amounts paid out to special messengers, for extra porterage, and for charges received at the outwards station, on behalf of, and paid out to, other companies.

q State here the destination of message to be transmitted from this station.

r Enter here the code of the station to which the message is signalled by you.

s Time when transmitted by you.

Porterage Return.

Swansea Station.

Four weeks ending January 28th, 1862.

Date.	Name of Sender.	From what Station.	Name and Address of Receiver.	Time received.	Time handed to Messenger for delivery.	Porterage paid by sender.	Porterage charged to receiver.	Amount paid out.	Distance—Miles.	How sent.	Messenger's signature for receipt of money.
							s. d.	*s. d.*			
Jan. 4	Martin.	L Y	Martin, Maindee	1·10	1·12		1 0	1 0	¾	Foot	J. Wilkes
							1 0	1 0			

Gratuities Return.

Swansea Station.

Four weeks ending January 28th, 1862.

Date.	Code Time.	Time forwarded	From whom.	To what Station.	Message Gratuities. Amount.			Time Gratuities. No. of hours.	Amount.		
					£	*s.*	*d.*		£	*s.*	*d.*
Jan. 5	7·3	7·10	Mason.	L Y		1	0				
	9·10	9·15	Malakoff.	L Y		1	0				
„ 19	9·15	9·16	Smith.	Frankft.		1	0				
						3	0				

	£	*s.*	*d.*
Message Gratuities.....	0	3	0
Time „			
Total.....	0	3	0

Clerk in Charge.

Swansea Station.

PETTY DISBURSEMENTS,

Four weeks ending January 28th, 1862.

Date.	No. of Voucher	Particulars.	Amount. £	s.	d.
Jan. 4	1	Extra Porterage		1	0
„ 5	2	Gratuities		2	0
„ 12	3	Soap			6
		Coals	3	0	0
„ 14		Wood		8	6
„ 19		Gratuities		1	0
			3	13	0

Swansea Station.

PAY BILL,

Four weeks ending January 28th, 1862.

Name.	Class	Time. wks.	Time. dys.	Rate.	Premiums. £	s.	d.	Extra Amount. £	s	d	Total Amount to receive. £	s.	d.	Signature for receipt of money.
Jones.	12	4	1	12s.					2	0	2	10	0	
									2	0	2	10	0	

Signature of Clerk in Charge.

BALANCE SHEET.

	£	s.	d.		£	s.	d.
Balance in hand last month	2	12	6	Pay Bill	2	10	0
Cash per order on B of E.	10	0	0	Sundries	3	13	0
				Balance to be carried forward to next month's account	5	19	6
	12	12	6		12	12	6

Swansea Station.

Balance Sheet,*

Four weeks ending January 28th, 1862.

Receipts Account.

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
Net Receipts	3	19	0½	Clerks' Salaries	2	8	0
Sundries				„ Overtime		2	0
				Sundries, exclusive of Porterage	3	12	0
Intelligence	2	2	11½	Returned Messages money.			
	6	2	0		6	2	0

Porterage Account.

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
Porterage paid here by sender for delivery by ordinary or special messenger, or by other conveyance		1	6	Messengers' Salaries		14	0
				„ Overtime		1	0
				Special Porterage, or messages delivered within 3 miles, as per Porterage return		1	0
Excess Porterage charged here		1	0				
				Deliveries by man and horse, train, or other means			
		2	6			16	0

Number of Instruments.			Authrizd. No. of		Number of Commercial Telegrams.										Number of Railway Telegrams.				
					Forwarded at the following rates.†							Total forwarded.	Total received.	Transmitted.					
Commercial.	Railway.	Total.	Clerks	Messengers.	1/-	1/6	2/-	3/-	4/-	5/-	7/6				Forwarded.	Received.	Transmitted.	Signals.	Total.
2	2	4	1	1			13	4	2	2	2	23	6	23					

* Although termed a "Balance Sheet," it is not deemed necessary that the aggregate amounts of the *Dr.* and *Cr.* sides agree.

† When the charges vary between any two of the amounts headed "number of commercial messages," the lowest of such amounts must be considered as applying to them; hence, a telegram for which 2*s.* 6*d.* was charged, would be treated in this return as a 2*s.* message; but when the charge exceeds 7*s.* 6*d.*, the 7*s.* 6*d.* column must include it.

Swansea Station.

COMPARATIVE RETURN OF THE LAST TWO MONTHS.

Report for four weeks ending January 28, 1862.

Description of Message.	Four weeks ending Dec. 31, 1861.			Four weeks ending Jan. 28, 1862.			Increase.			Decrease.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Ordinary paid messages.....	3	1	0	3	5	6*		4	6			
Messages with stamps affixed, less discount					13	6½		13	6½			
Total net receipts.....	3	1	0	3	19	0½		18	0½			
				3	1	0						
					18	0½						
Porterage		2	0		1	6						6
Amount paid out	1	14	0	1	14	3			3			

COMPARISON OF LAST MONTH WITH CORRESPONDING MONTH OF LAST YEAR.

Description of Message.	Four weeks ending Jan. 28, 1861.			Four weeks ending Jan. 28, 1862.			Increase.			Decrease.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Ordinary paid messages.....	3	6	0	3	5	6						6
Messages with stamps affixed, less discount		10	0		13	6½		3	6½			
Total receipts	3	16	0	3	19	0½		3	6½			6
				3	16	0			6			
Increase or decrease					3	0½		3	0½			
Porterage					1	6						
Amount paid out	3	15	0	1	14	3						9

Weekly average for last half year £0 10 6½

„ „ present „ 0 11 4

* Aggregate amount of columns *m*, *o*, *p*, and *t*, in Form I.

[Another form of Balance Sheet.]

BALANCE SHEET. *Swansea Station.*

Four weeks ending January 28th, 1862.

Dr. *Cr.*

	Amounts. £	s.	d.	Totals. £	s.	d.		Amounts. £	s.	d.	Totals. £	s.	d.
Balance brought from last month's account	2	12	6				Paid out to other Companies						
				2	12	6	Paid to Special Messengers		1	0		1	0
Extra words			9				Clerks' salaries	2	8	0			
This Company's earnings—							,, overtime		2	0			
Forward messages	2	16	9				,, gratuities		3	0			
Replies		5	0				Messengers' salaries		14	0			
Intelligence	2	2	11½				,, overtime		1	0			
Porterage		1	6								3	8	0
				5	6	11½	Sundries, viz.:—Coal	3	0	0			
Received on account of other Companies	1	14	3				Soap			6			
Extra Porterage, as per Inwards Account		1	3				Wood		8	6			
Gratuities		3	0								3	9	0
				1	18	3	Amount carried forward to next month's account	2	19	8½			
Cash withdrawn from bank...											2	19	8½
Sundries, viz.:—													
				£9	17	8½					£9	17	8½

"outwards entries" which are enumerated

ES FORWARDED.

ding January 28th, 1862.

egrams only to which Stamps are affixed.				Additional Charge for—		Net receip	
l				*m*	*n*	*o*	
Numbers of Stamps to be columns to which they refer.				Words short pd. by stamp.	Portenage beyond limits of free delivery	Amount for forward Messages.	Amount for
s. d.	Green. 2s.	Blue. 3s.	White. 4s.	s. d.	s. d.	s. d.	s.
	...	...	...	...	...	R P	
	...	...	...	...	...	2 6	..
..	...	...	...	...	...	2 6	2
..	...	...	...	...	...	2 6	2
..	...	...	...	...	...	2 6	2
..	..	...	...	...	...	R P	
						10 0	7

[The following is

Station.

a	*b*	*c*	*d*	*e*	ED TELEGRAMS.	
					r	*s*
Date of Telegram.	Consecutive No. of Telegram.	Consecutive No. of transmitted Telegram.	Time Code.	Time received at this Station.	transmitted from here.	Time forwarded.
Jan. 1	1		8·4 a.m.	8·18 a.m.		
	2		8·12 „	8·24 „		
	3		8·30 „	8·35 „		
„ 2		1	6·8 „	6·22 „	gue	6·35 a.m.
„ 3	4		10·8 „	10·18 „		
	5		10·30 „	10·45 „		
„ 4	6		10·50 „	11·0 „		
	7		6·5 „	6·10 „		
„ 5	1		7·3 p.m.	7·20 p.m.		
	2		9·10 „	9·18 „		
„ 6		1	12·11 „	12·20 „	gue	12·40 „
„ 7			Nil			
„ 8	1		7·19 p.m.	7·25 „		
„ 9			Nil			
„ 10	2		9·6 p.m.	9·20 „		
„ 11			Nil			
„ 12			Nil			
„ 13	1		8·50 a.m.	9·0 a.m.		
„ 14	2		8·55 „	8·59 „		
„ 15			Nil			
„ 16			8·10 a.m.	8·20 „		
„ 17			Nil			
„ 18			Nil			
„ 19	1		9·15 a.m.	9·20 „		
„ 20	2		12·10 p.m.	12·22 p.m.		
	3		12·10 „	12·24 „		
„ 21			Nil			
„ 22			Nil			
„ 23			Nil			
„ 24	1		12·12 p.m.	12·16 „		
„ 25	2		1·4 „	1·20 „		
„ 26			Nil			
„ 27			Nil			
„ 28	1		4·0 p.m.	4·15 „		
	2		5·10 „	5·20 „		

V., to face p. 59.

We have assumed the messages included in the Swansea "forwarded abstract book," to have been transmitted by Cardiff. The following is an example of the return which would be made by that station of—

Cardiff Station.

TRANSMITTED MESSAGES.

Four weeks ending January 28th, 1862.

Date.	Consecutive Number of Telegram.	Time received at this Station.	Station from	Instrument from.	From	To	For what place.	To what Station sent from hence.	Time forwarded.
Jan. 1	1	8·8 a.m.	S N	S N	Jones	Brown	L Y	L Y	8·18 a.m.
	2	8·14 „	„	„	Martin	Bird	Calais	„	8·24 „
	3	8·35 „	„	„	Mason	Slidell	L Y	„	8·35 „
„ 2	4	6·12 „	„	„	Fould	Persigny	Paris	„	6·22 „
„ 3	5	10·14 „	„	„	Cover	Box	L Y	„	10·18 „
	6	10·40 „	„	„	Louis	Napoleon	„	„	10·45 „
„ 4	7	10·55 „	„	„	Phipps	Martin	Chatham	„	11·0 „
	8	6·8 „	„	„	Weaver	Budd	L Y	„	6·10 „
„ 5	1	7·10 p.m.	„	„	Mason	Jones	„	„	7·20 p.m.
	2	9·15 „	„	„	Malakoff	Cambridge	„	„	9·18 „
„ 6	3	12·18 „	„	„	Frederick	Royal	Brussels	„	12·20 „
„ 7		Nil							
„ 8	1	7·20 „	„	„	Jones	Matthews	L Y	„	7·25 „
„ 9		Nil							
„ 10	2	9·10 „	„	„	Tasker	Nashville	Madrid	„	9·20 „
„ 11		Nil							
„ 12		Nil							
„ 13	1	8·55 a.m.	„	„	Marshall	Knowles	L Y	„	9·0 a.m.
„ 14	2	8·56 „	„	„	Rowe	Jordan	„	„	8·59 „
„ 15		Nil							
„ 16	1	8·18 „	„	„	Clements	Lloyd	„	„	8·20 „
„ 17		Nil							
„ 18		Nil							
„ 19	1	9·16 „	„	„	Smith	Jones	Frankfort	„	9·20 „
„ 20	2	12·19 „	„	„	Marsh	Marsh	L Y	„	12·22 „
	3	12·22 „	„	„	Marsh	Bird	„	„	12·24 „
„ 21		Nil							
„ 22		Nil							
„ 23		Nil							
„ 24	1	12·14 „	„	„	Cairn	Cairn	„	„	1·26 „
„ 25	2	1·8 p.m.	„	„	Mason	Slidell	„	„	1·20 p.m.
„ 26		Nil							
„ 27		Nil							
„ 28	1	4·10 „	„	„	Williams	Trent	„	„	4·15 „
	2	5·20 „	„	„	Jacobs	Lincoln	„	„	5·20 „

S N is the code for Swansea. [*Form IV.*

RAILWAY COMPANIES' FORMS, ETC.

The forms on which the telegrams are written which have reference to railway matters, and are addressed from one railway official to another, differ from those in general use; it may therefore be necessary to submit, for the information of the reader, the *pro formæ* which are peculiar to that service

FORWARDED MESSAGE.

[All messages must be distinctly written, and no abbreviations used by the sender, who must enter the time at which he delivers it to the clerk.]

Newport Station.

Prefix, D B.* Code time, K F.† Number of words, 16.

June 1st, 1862.

Received, 10·30 a.m. Sent to Gloucester Station,
Finished, 10·33 „ By me, J. WILKES, Clerk.

From { R. JONES, Newport Station, } *To* { C. THOMAS, Gloucester Station. }

Truck two six four arrived here unentered. Please furnish particulars.

Signature of sender, R. JONES.

---

* D B signifies Railway Message.
† K F, 10·30, the time received from sender.

RECEIVED MESSAGE.

Prefix, D B. Code time, K F. Number of words, 16.

Code of Station from which the Message is received.	Receipt finished.	Signature of Receiving Clerk.	Code of Station to which the Message is transmitted.	Transmission, or time sent out for delivery.	Signature of Transmitting Clerk or Messenger.
N P	10·33 a.m.	T. Brown		10·34 a.m.	J. Williams

The following message forwarded from Newport Station received at Gloucester Station June 1, 1862:—

From { R. JONES, Newport Station, *To* { C. THOMAS, Gloucester Station.

Truck two six four arrived here unentered. Please furnish particulars.

Receiver's initials, C. T. Time received, 10·35 a.m.

Lydney Station.

TRAIN SIGNAL BOOK,

For registering the time of departure, &c., of Trains.

June 1st, 1862.

Train.		Time of Departure.	Time reported to office.	Signalled, *i.e.*, Telegraphed.		Remarks.
Date of.	Description.			Time.	To what Station.	
4·0	Goods	5·4	5·5	5·10	Chepstow	
6·10	Passenger	8·5	8·10	8·12	Gloucester	
7·0	„	9·0	9·1	9·3	Newnham	
8·30	„	9·30	9·32	9·34	Neath	
11·0	Goods	11·0	11·1	11.3	Llandore	
12·0	„	1·0	1·5	1·6	Magor	

The date of train means the time at which the train is appointed to commence its journey.

The code T A is the prefix for train reports.

It is the practice for the clerk in charge of the instruments at a station, to render to his superintendent a periodical report of the state of the instruments and batteries, and another of the signals, and to point out the nature of the defects, if any. Example,—

Bridgend Station.

REPORT OF INSTRUMENTS, BATTERIES, ETC.

Week ending July 12th, 1862.

Date.	State of Instruments.	State of Batteries.	State of Bells.	State of Bell Batteries.	When reported to Inspector.
Sunday	Good	Good	Good	Good	Monday
Monday	Axle broken	Weak	"	"	"
Tuesday	All right	Good	"	"	Tuesday
Wednesday	Coil broken	"	"	"	Thursday
Thursday	Needle broken	"	"	"	"
Friday	New dial wanted	"	"	"	Friday
Saturday	Good	"	"	"	"

Signature of Clerk, J. SMITH.

Bridgend Station.

REPORT OF SIGNALS.

Week ending July 12th, 1862.

Nature of Fault.	Circuit.	Date and time first observed.	Date and Time of advising Inspector.	Date and time when rectified
Earth	Through	July 8, at 10·10 a.m.	July 8, at 10·13 a.m.	July 8, at 12·50 p.m.
Broken down	"	" 10, at 12 noon	" 10, at 1·5 p.m.	" 10, at 2·40 "
Contact between Railway and Commercial	Short	" 12, at 9·10 p.m.	" 12, at 9·15 "	" 12, at 12 noon

Signature of Clerk, J. SMITH.

RAILWAY TRAIN TELEGRAPH.

Between certain stations there are telegraphs which are exclusively devoted to the guidance of the officials in the despatch of trains. These denote if the line is clear or otherwise.

The pointers or needles in each section of the dial, are of distinct colours, viz., black and red; the positions of the black are influenced by the operator at the station only which is in communication with yours; whilst the movements of the red are regulated by you, and indicate the signal transmitted from your station. To this description of instrument belong a bell and gong, the application of both of which is explained in the following codes:—

Code for Bell.

1 Beat—Acknowledgment of signal of down train.

2 Beats—Indicate the despatch of an up passenger train.

3 Beats— „ „ „ up goods or mineral train.

Code for Gong.

1 Beat—Acknowledgment of signal of up train.

2 Beats—Indicate the despatch of a down passenger train.

3 Beats— „ „ „ down goods or mineral train.

Code for Gong or Bell.

5 Beats—Denote an obstruction on the line, and should be given after the signal "up or down train on line."

5 Beats—Acknowledgment of above signal.

6 Beats—Signify that the instruments are being tested.

6 Beats—Acknowledgment of above signal.

The signals, "train on line," or "line clear," have reference to that portion of the line only between the two stations sending or receiving them. The regulations to be observed are—

Supposing that an up passenger train is due to start from station A to station B, and the latter has telegraphed "line clear" (but not otherwise), the train may be despatched. A has now, without a moment's delay, to communicate with B by two strokes on the bell at the latter station; and the duty of B will then be to acknowledge, by sounding the gong at A once, and instantly telegraphing back, "up train on line." When the train has passed the station B, B must reverse the signal to "up line clear." If it be an up goods or mineral train, three notes must be intoned on the bell at station B, and the subsequent course of procedure will be as for an up passenger train.

In telegraphing down trains, the gong instead of the bell must be sounded at station B; and B must acknowledge receipt of such signal by striking the bell once at station A, and then telegraphing "down train on line." When the train has passed, he must reverse the signal to "down line clear."

BYE-LAWS.

If any person in the service of the Telegraph Company shall wilfully or negligently omit or delay to transmit or deliver any message or signal; or shall wilfully or negligently do anything whereby the transmission or delivery of any message or signal shall not take place, or shall be delayed or prevented; or shall wilfully or negligently omit to do or perform any act or thing, by reason whereof any message or signal shall not be transmitted or delivered, or shall be delayed in its transmission or delivery; or shall improperly divulge the purport of any such message or signal to any person, shall, for every such offence, forfeit a sum of money not exceeding £20.

If any person shall wilfully remove, destroy, damage, or obstruct the working of any electric telegraph which shall or may have been lawfully erected, or any wire, standard, apparatus, or other part of any such telegraph, or any works connected therewith, he shall be guilty of a misdemeanour.

If any person shall wilfully or negligently break, throw down, damage, destroy, or injure any such telegraph, or any wire, standard apparatus, or other part of any such telegraph, or any of the works connected therewith, and shall not make sufficient satisfaction for the damage thereby done them, it shall be lawful for the Company to recover such damages from the person so offending as any two justices shall think reasonable.

With respect to offenders whose names or residences are not known, be it enacted that any officer or servant of the Company, or any constable or servant of any railway company along or near to whose railway the telegraph, or any of the apparatus thereof, shall or may be erected or placed, or any other constable, and all persons called by any such officer, servant, or constable as aforesaid, to his assistance, shall or may seize and detain any person who shall or may, in the presence of such officer, have wilfully broken, injured, or obstructed the working of the telegraph of or belonging to the Telegraph Company, or any of the wires, standards, instruments, apparatus, or other parts of any such telegraph, and whose name or residence shall be unknown to such officer, servant, or constable, and shall or may carry such offender, with all convenient speed, before some Justice, without any warrant or other authority than this Act; and such Justice shall proceed, with all convenient speed, to the hearing and disposing of the complaint which may be preferred against such offender.

TELEGRAPH COMPANIES.

The Atlantic Telegraph Company.

Established 1856.

Secretary—George Seward, Esq.
Chief Office—22, Old Broad Street.

Length of Cable, 3,000 miles. In operation from the 5th of August to the 3rd of September, 1858—scarcely a month; during which time 366 messages, consisting of 3,942 words, were transmitted.

The British and Irish Magnetic Telegraph Company.

Established 1856.

Secretary—Edward B. Bright.
Chief Offices—Threadneedle Street, E.C., and Exchange Buildings, Liverpool.

Extent, 4,000 miles. Employs 1,500 officers.

Bonelli's Telegraph Company.

Secretary—
Chief Office—Lincoln's Inn Fields, W.C.

The Electric and International Telegraph Company.

Incorporated 1846.

Secretary—J. S. Fourdrinier.
Chief Office—Telegraph Street, Moorgate Street, E.C.

Extent, 7,222 miles. Miles of wire employed, 34,255. Number of Instruments, 3,719. Number of stations in Great Britain and Ireland, 841.

THE LONDON DISTRICT TELEGRAPH COMPANY.

Secretary—Charles Curtoys.
Chief Office—Cannon Street, E.C.

Extent, 92¼ miles. Miles of wire, 378¼. Number of Stations, 70.

THE LONDON AND SOUTH OF IRELAND DIRECT TELEGRAPH COMPANY

Secretary—W. A. Travers Cummins, Esq.
Chief Office—7, Broad Street Buildings.

Extent, 454 miles.

THE MEDITERRANEAN EXTENSION TELEGRAPH COMPANY.

Secretary—Henry C. Orton.
Chief Office—Gresham House, Old Broad Street, E.C.

This Company's lines extend from Otranto to Corfu, and from Malta to Sicily, communicating with this country *viâ* Naples.

THE SUBMARINE TELEGRAPH COMPANY.

Established 1852.

Secretary—L. Walter Courtenay, Esq
Chief Office—58, Threadneedle Street.

Extent, 887 miles. Average number of messages transmitted annually, 300,000. In communication with 3,000 continental stations.

TELEGRAPH TO INDIA, INCORPORATED WITH THE RED SEA TELEGRAPH COMPANY.

Secretary—C. L. Peel, Esq.
Chief Office—62, Moorgate Street, E.C.

Extent—Land line, 1,000 miles; sea line, 1,440 miles; land and sea, 640 miles. Total, 3,080 miles.

THE UNITED KINGDOM TELEGRAPH COMPANY.

Secretary—W. Andrews, Esq.
Chief Office—237, Gresham House, Old Broad Street, E.C.

THE UNIVERSAL PRIVATE TELEGRAPH COMPANY.

Secretary—L. C. Herbert.
Chief Office—48, Strand.

THE VICTORIA TELEGRAPH COMPANY.

Secretary—Charles Todd, Esq., Observer and Superintendent of Telegraphs.
Chief Office—Adelaide.

GENERAL TELEGRAPHIC WORKS COMPANY.

Secretary—James Henson.
Chief Office—215, Gresham House, Old Broad Street, E.C.

Telegraph mileage in Great Britain and Ireland	15,000
" " in other parts of Europe	80,000
" " in America	48,000
Total of land mileage of telegraphs	150,000

Yearly average of receipt for telegraphic communications, £350,000.

APPENDIX.

THE Hughes' printing telegraph instrument is based upon entirely different principles to all other telegraph instruments now in use.

The main object of this invention has been to reduce the work to be performed by electricity to the least possible amount, both as regards the number and duration of the electrical waves, and the sensitiveness and rapidity of the recording apparatus.

The Hughes' system depends for its correct action on the subdivision of time between each signal or letter. Each electrical impulse of the same duration of contact producing the desired letter.

All other systems, such as Morse's recorder, Wheatstone's needle, Bains' chemical and the dial, or step by step letter-pointing telegraph instruments, depend either upon the number and duration of different signals to produce the letter intended, or upon a certain number of signals indicating a certain letter.

In order to obtain these results, we must secure—1st. Perfect synchronism or time keeping of two or more instruments. In the Hughes' instrument the speed is regulated by means of the vibrating spring; and the differences of speed of each, or of two or more instruments, are, in addition to the regulation by the vibrating spring, corrected at each letter by means of a correcting cam, which adjusts any difference that might exist. 2nd. The sending of the currents should be perfect as regards intervals of time and duration of contact. This is obtained by means of the revolving contact-maker being geared to the type-wheel shaft, which is already regulated by the vibrating spring. 3rd. The arrival of the current should be perfectly recorded, both as regards the intervals of time and the signals obtained. This result is secured by using the holding power of a natural magnet acting strongly through the cores of an electro-magnet upon the armature. The current merely detaches the armature from the poles of the electro-magnet, consequently the armature can move with any rapidity wished for. The right letter is recorded by means of the machine pressing the paper against the type-wheel the instant the armature rises.

Before, however, describing the instrument in detail, we will in a few words give a general idea of its action:—

The instrument is driven by a weight, acting upon a train of wheels, and its speed is governed by a vibrating rod. The type-wheel revolves continuously, and carries by means of bevel wheels a contact-making arm, which travels around a disc of pins acted upon by the finger-keys; whenever any one of these keys are pressed down, the corresponding pin comes into contact with the revolving arm at the time wished for. The current is thus sent on the line, passing through the electro-magnet, detaching the armature, which in its rapid upward motion comes in

contact with a detent, which locks at will a small shaft to the train in motion. A cam on the shaft raises the paper against the type-wheel, causing the impression of the letter intended on the paper. At the receiving station, the current acts in the same way as in transmission, detaching the armature, thus permitting the printing shaft to make one revolution and to take the impression of the intended letter—once for each current received.

The type-wheel of the receiving station is brought in unison with the transmitting one by a simple detent, which by pressing does not allow them to start but from a given point, thus starting them in unison.

Having thus briefly given an idea of its operation, we will now examine the most striking features of this instrument; and first amongst these, from its importance and supposed difficulty, must stand the means by which perfect synchronism is maintained in instruments many hundreds of miles apart.

Many attempts have been made to obtain synchronism at high speeds. Combinations of pendulums, centrifugal balls, fans, &c., have been tried without success, and Professor Hughes was the first to arrive at this point, by the employment of the rapid vibrations of a steel rod or spring. In Hughes' instrument the free end of a round vibrating rod is attached to a crank upon the fly-wheel, its other end being held fast in its support. The free end has perfect freedom to increase or diminish its arc of vibration according to the force employed upon it. The greater the motive power the greater the arc of vibration; but no amount of motive power can alter the speed or number of the vibrations. The force is merely transformed into greater or less arcs of vibration. Thus the instrument is obliged to run only at the speed allowed by the vibrations of the rod; and in order to bring two or more instruments to the same perfect rate of speed, it is only necessary to move a sliding weight upon the rod, which can be done during motion.

The number of vibrations per minute are 840; the type-wheel making 120 revolutions in the same time; and at this high rate of speed the instruments can easily be adjusted to such perfection, that the error per minute does not exceed one thirty-thousandth part of a second.

There is, however, no necessity for this extreme accuracy, as at each letter printed—which upon the average is at the rate of 200 per minute —a correction takes place by means of a wedge-shaped corrector or cam acting upon the interstices of a wheel in connection with the type-wheel; these being held to the type-wheel shaft by friction, allows the type-wheel to be advanced or retarded as required.

The next feature of importance is the arrangement of the electro-magnet by means of which the maximum effect is obtained instead of the minimum, as in all other telegraphic arrangements. In this invention the armature rests constantly against the cores of the electro-magnet, being held strongly by induced magnetism produced from a strong permanent magnet polarising the cores of the electro-magnet. An adjustable spring on the armature tends constantly to draw it from the poles; but the holding of the induced magnetism being the stronger retains the armature in its position until a current is sent through the electro-magnet neutralising the induced magnetism. The spring then becomes the stronger; draws the armature rapidly away with the full force of the spring; the arma-

ture comes in contact with a detent which unlocks the printing shaft, and this shaft whilst taking the impression replaces gently by means of a cam the armature in its normal position against the poles of the electro-magnet. Suppose the induced magnetism in the cores of the electro-magnet held the armature with a force of 100, and the spring opposes a force of 91, it is evident that a simple depolarising of but 10 would allow the armature to rise with all the rapidity and force of 21. Suppose, again, the spring more nicely adjusted, say to 99·9, then ·2 would be amply sufficient to make it work with the same force as before. In fact, the only limit to the sensibility of this arrangement is the close approximation to which we can balance these forces. Thus it may be seen that the armature is placed in the best condition to feel the maximum of electro-magnetic disturbance in the cores—near the poles; and after leaving and performing its work, it is replaced by the machine. Therefore there is really no action whatever for electricity to perform; it has really only to produce a slight magnetic change in the cores, and this but once for each letter.

The arrangements of the electrical circuits in this invention are also important, allowing only the required quantity of current to pass through the instrument. The instant the armature rises, the current, instead of passing through the electro-magnet, passes by a short wire direct either to line or earth. Supposing that 100 of currents arrived, and 5 sufficed to detach the armature, the surplus 95 would pass without resistance direct to earth. This arrangement is not only important as regards allowing only the required quantity to pass through the electro-magnet, but more important in the case of submarine lines, as the return current is discharged to each direct, without passing through the electro-magnet, and it is thus discharged during the whole revolution of the printing shaft.

The mechanical portions of the instrument which perform important functions will now be described briefly:—

The type-wheel contains a simple arrangement, by means of which the letters of the alphabet or figures are printed: with 28 keys it prints 54 different characters. This result is gained by obtaining the letters and figures alternately on the type-wheel, and, by a lever, forcing the type-wheel to present one or the other series at will. In order to do this, the correction-wheel is fixed upon an independent axle from that of the type-wheel, and the two are locked together by a lever with two projections, which are acted upon by the corrector, thus turning the type-wheel for either series of characters as desired.

Upon the printing shaft is a catch which locks the fly-wheel shaft and printing shaft together. This catch is solicited to do so by a strong spring when the detent releases it; it instantaneously does lock by the catch falling down an incline on to a tooth-wheel on the fly-wheel shaft; but as the shaft revolves, the catch comes up the inclined plane, which raises the catch free of the tooth-wheel. After it has just passed the centre of the inclined plane, it cannot again descend until released by the action of the detent, as it blocks against the detent.

The contact-maker consists of a vertical shaft—divided into two insulated portions at its lower extremity, and bearing a projecting arm. The upper part of the shaft is in communication with the wheels and frame-work of the instrument. The lower of the two projecting arms is in

communication with the tube upon which it turns, and which passes through the centre of the brass disc of keys; but is insulated from this disc by means of a large piece of ivory in the centre of the disc. The connection between the two arms is made by means of a contact screw upon the lever moving on the upper arm. The point of the screw when resting upon the lower arm forms a metallic connection between these two arms, a spring upon the lever keeping it firmly pressed against the lever arm. There is also an insulated steel plate under the lower arm with two angles, for the purpose of preventing false or short contacts, and throwing the key pins out of range when the keys are held longer than necessary.

In practical use, at the commencement of each morning's service, it is usual to make a few "blanks," or in other words, touch the same key consecutively in order that the synchronism of the instruments may be perfectly adjusted; for instance, Liverpool sends blanks by touching his key corresponding to the blank on the type-wheel; and if London prints A, then B, and so on, the apparatus at London is running too fast, and the operator retards the regulator; if he receives Z, then Y, and so on, his apparatus is running too slow, and he advances the regulator until his apparatus also makes nothing but blanks, when both are ready to communicate. Blanks may be struck at every revolution or at every five or ten or more, thus testing the synchronism to any desired extent.

The preliminary verification each morning requires but a few seconds, and the instruments are then ready to transmit the actual messages.

It will be seen from a careful study of this instrument that it possesses special merits, not only for land lines, but for long submarine lines, from the fact of its requiring but one wave to each letter, and from the sensitiveness and simplicity of the electrical arrangements.

Theoretically its speed is three times greater than the Morse, and this has been fully borne out in the many numerous practical trials the instrument has had. The patents for this instrument have been purchased by the Governments of France and Italy, after a series of practical trials of one year's duration. It is now in daily use on their most important lines. In the United States it has been purchased by the American Telegraph Company, and has been in operation there since 1855, although since that time many important improvements have been effected. The United Kingdom Telegraph Company possesses the sole right for Great Britain, and this instrument is in daily operation upon their lines between Liverpool, Manchester, and London. The severe practical tests that this invention has been successfully subjected to in several countries, and in the course of several years, sufficiently demonstrate that the various advantages it professes to possess are not merely the logical results of theoretical principles, but are substantial facts, which have effectually aided in removing the grave difficulties that have so long retarded the progress of telegraphy.

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