

www.libtool.com.cn

THE
STORY OF THE
TELEGRAPH IN INDIA.

CHARLES C. ADLEY.



www.libtool.com.cn

800018461Q



www.libtool.com.cn

www.libtool.com.cn

THE STORY
OF
THE TELEGRAPH IN INDIA.

BY
CHARLES C. ADLEY, C.E.

“Open rebuke is better than secret love.”—PROV. xxvii. 5.

“When the iron is hot enough the public will strike it; and depend upon it, when the time comes, they will strike it vigorously.”—CALCUTTA ENGINEERS’ JOURNAL, vol. iv. p. 38, 1861.

LONDON:
E. & F. N. SPON, 16, BUCKLESBURY, E.C.
1866.

226 i. 63.

www.libtool.com.cn



DEDICATION.

TO

ROBERT WYGRAM CRAWFORD, Esq., M.P.

&c. &c. &c.

SIR,—As you are the Chairman of the Committee appointed by authority of the House of Commons to investigate the state of our East India Telegraphic and Postal communications, and as you are also Chairman of The East Indian Railway Company, in whose service I have had the honour of being engaged for nine years, I cannot otherwise than more appropriately submit the dedication of this little work to you. Having now for more than ten years ceaselessly advocated the adoption of those measures indispensable to remedy the unhappily benighted condition of Telegraphic science and accommodation in India, I feel unable at the present juncture to resist contributing my feeble efforts towards the accomplishment of that great end, so long demanded by public necessities, yet neglected and thwarted only by the guardians of the public weal.

I have the honour to be,

Sir,

Your most obedient and humble servant,

CHARLES C. ADLEY.

Lee Park, Blackheath,
19th May, 1866.

www.libtool.com.cn

P R E F A C E.

THIS, though a preface, is essentially a postscript. Since this work was in the press, the Committee appointed by the authority of Parliament to examine into the state of the telegraphic and postal communications between England and her Majesty's Eastern possessions have concluded their sittings so far as India is concerned. Having heard the evidence on both sides concerning the working of the telegraph in India, the author finds that nothing new has transpired affecting in the slightest degree the opinions and conclusions herein enforced. On the contrary, these have been only confirmed and substantiated. The deficiencies of the Indian telegraph are freely and unanimously admitted by the Government authorities, while the following official explanation, in reply to question No. 2611, justifies the course which has been pursued :

“ I think that in a Government institution, such as the telegraph, the efficiency of its operations will essentially depend upon the manner in which the Government authority is exercised ; and I think that the present system is essentially defective, and that, although a certain amount of alteration and improvement has been made now, precisely the same causes which have led to the Government telegraph lines falling into arrears in the supply of the wants of the country will continue to act, and that the same causes which have prevented the Government keeping up to the mark, and which tend, so to speak, to improvement, will still continue to act.”

It is clear that just as the whole system of Indian administration, with its peculiar bias and ideas, collapsed

in the Mutinies of 1857, so the telegraph department has been undergoing a series of collapses during the past ten years. If then Parliament were able to reconstruct the Government of an empire, that ability may well be exercised in reforming one of the petty sections of that administration. And the necessity for this is intensified by the fact that three fair trials at reform have been allowed by the public, and all have signally failed, supplemented by a large unnecessary loss to the State exchequer. One point is certain from the evidence, viz., that the Government in India will not, without Parliamentary intervention, surrender the clause in their local Acts securing to themselves the monopolies of telegraphic undertakings in India. But as the Indian Government have before now been compelled by public opinion to surrender other monopolies to private enterprise, it is to be hoped that Parliament will in its wisdom devise some plan for emancipating telegraphic science and progress in that empire.

This little work might have been extended to a very considerable length, for there is no lack of evidence; but, for obvious reasons, the argument, often unpleasant, has chiefly been confined to official statements and documents, because these must necessarily be reliable. It is possible that in one or two places a strong expression may have accidentally crept in; if so, it must be excused on the plea that, with the public, the author has felt strongly on the subject.

C O N T E N T S.

CHAPTER I.

	PAGE
HISTORICAL EPITOME OF THE INTRODUCTION OF THE TELEGRAPH INTO INDIA	1

CHAPTER II.

PLANS PROPOSED IN 1850 AND 1852	7
---	---

CHAPTER III.

PHILOSOPHICAL EXPERIMENTS	10
-------------------------------------	----

CHAPTER IV.

INSULATION	20
----------------------	----

CHAPTER V.

CRISES AND TENTATIVE REFORMS	24
--	----

CHAPTER VI.

THE TELEGRAPH ACTS, XXXIV. OF 1854, AND VIII. OF 1860 . . .	34
---	----

CHAPTER VII.

ARGUMENTS IN DEFENCE OF MALADMINISTRATION	46
---	----

CHAPTER VIII.

AN ERRATIC POLICY	51
-----------------------------	----

CHAPTER IX.

	PAGE
FINANCIAL FAILURE, AND ARGUMENTS IN DEFENCE	55

CHAPTER X.

AN EPISODE	60
----------------------	----

CHAPTER XI.

ORACLES OF DESTINY	67
------------------------------	----

CHAPTER XII.

EFFORTS AT EMANCIPATION	72
-----------------------------------	----

APPENDIX.

THE GREAT OPIUM FRAUDS	81
COBWEBS	85

www.libtool.com.cn

APHS PROPOSED IN 1850.

<i>PHS in EUROPE</i> Constructed and in Progress	Miles	Shown thus
<i>Proposed in INDIA</i> on Circular System	10,920	-----
ANGLO-INDIAN from GRAEN to CONSTANTINOPLE	5,140	-----
in connecting link from CONSTANTINOPLE to PESTH	1,400	-----
COAST ROUTE from GRAEN to NOWANUGGUR	700	-----
	1,500	-----

Note. The above figures refer to the mileage in 1850.
At the time this Plan was devised Sindh and consequently Kurrachee was not a part of British Territory.



Charles Adley C.E.

CHAPTER I.

HISTORICAL EPITOME OF THE INTRODUCTION OF THE TELEGRAPH INTO INDIA.

THE history of the Telegraph in India is briefly recorded.

In May, 1839, Dr. William Brooke O'Shaughnessy* erected an experimental line of wire, twenty-one miles in length, in the vicinity of Calcutta. The wire was suspended upon bamboo poles, and on the completion of the experiments, which were eminently successful, it was taken down and the results published. At the same time, the importance of the introduction of the telegraph into India was strongly urged.†

On the 26th of September, 1849, the Court of Directors of the late Honourable the East India Company referred to the foregoing experiments, and directed the attention of the Government of India to the advisability and importance of establishing a system of telegraphs throughout that empire.

About the same time, others were occupying their

* Afterwards Sir William O'Shaughnessy, and now Sir William Brooke.

† *Vide* Journal of the Asiatic Society for Bengal, September, 1839.

minds with the subject, and, preparatory to propounding a definite scheme, two long pieces of gutta-percha covered copper wire were despatched experimentally to India.* One of these was vulcanised, the other not. The object was to ascertain if wire, so protected, would withstand the ravages of the white ants, the great enemies to underground operations in that country, for at that period, the merit of the overground or underground system was a debated and unsettled question in Europe. The experiment was perfectly successful, and in September, 1850, an elaborate communication was addressed to the Chairman of the Court of Directors of the late Honourable the East India Company, wherein proposals were submitted for the establishment of a comprehensive system of political and mercantile lines throughout India, and some pains were taken to show the advantages that would accrue to the Government and the public therefrom.* The report also comprised the details of a scheme for establishing telegraphic intercourse between England and India *viâ* the Persian Gulf. In reply, it was stated that the subject was then under the consideration of the Government.

The accompanying map, which is an exact copy of the general plan drawn out more than fifteen years ago, will exhibit a sketch view of these projects, and it is remarkable how closely the plans then devised assimilate with what have been subsequently carried out at the present time.

Two months later, reports were submitted to the Government in India by the late Colonel Forbes and Dr. O'Shaughnessy upon the subject, and, after some

* *Vide* Letter addressed to the late Sir Archibald Galloway, K.C.B., Chairman of the Court of Directors of the late Honourable the East India Company, September, 1850, by Charles C. Adley, C.E.

discussion upon the overground and underground systems, it was decided that an experimental line should be constructed of thirty miles in length, partly overground and partly subterranean. This line was commenced in October, 1851, and opened in December following. It was then extended underground to Kedjeree eighty-two miles; and in March, 1852, the line from Calcutta to the sea was opened for official and public correspondence. Of this line, sixty-nine miles were overground and eleven subterranean, and the mean average cost was 59*l.* 8*s.* 1*d.* per mile. The wire used consisted of pieces of iron rod $\frac{3}{8}$ in. diameter, 13 ft. 6 in. long, welded together, and weighing $17\frac{1}{2}$ cwt. to the mile. In the overground portion the rod was placed in a notch cut in the top of bamboo poles 15 ft. high, and placed 200 ft. apart, being strengthened at every furlong by stout sâl or iron wood posts, to which the rod was clamped. The underground portion was coated with layers of Madras cloth saturated with melted pitch mixed with tar and then placed in a trench 2 ft. deep, "laid in a row of roofing tiles half filled with a melted mixture of three parts dry sand and one part resin by weight, and when laid the whole was then filled up with the same melted mixture."* The trench was then filled in and rammed down in the usual way. At the river crossings, which were about a mile wide, various plans were tried, viz., 1. A copper wire insulated with wax and tape. 2. An iron wire rope. 3. A gutta-percha covered copper wire undefended. 4. Gutta-percha covered wire similar to that first laid between Dover and Cape Grisnez; and 5. A gutta-percha covered copper wire secured in the angles of a chain cable. The first four plans were soon destroyed

* Records of Bengal Government, March 10, 1851.

by the grappels of native vessels, while the last proved successful.

The working of this experimental line was highly satisfactory, and the returns during the first three months of opening were equivalent to a dividend of five per cent. on the outlay, after deducting the working expenses.

These results having been duly reported on the 14th of April, 1852, Lord Dalhousie, then Governor-General of India, adopted measures for constructing an extensive series of lines between Calcutta, Bombay, Madras, and Peshawar, and on the 3rd of May, Dr. O'Shaughnessy was despatched to England on the subject. Before his arrival in London, on the 20th of June, the proposition of the Governor-General had been acceded to by the Court of Directors and Board of Control, and on the 1st of August, the contracts were entered into for the supply of 5600 miles of wire (No. 1, B. W. G.) and other materials in proportion.

These materials were manufactured and despatched to India with the utmost alacrity, and on the 24th of March, 1854, a temporary flying line of telegraph was opened between Calcutta and Agra, 796 miles, and the connexion between Calcutta, Madras, and Bombay was completed by a similar temporary line by the 1st of January, 1855. On the 1st of February following, or within two years and a half of the commencement of the undertaking, these lines, amounting to 3544 miles, were opened to the public.

The construction of these lines was effected in two stages. 1. The erection of a temporary flying line. 2. The strengthening and insulating the flying line. The first of these operations was to be carried out with the utmost speed, the second at leisure. There was

also a third stage proposed in the manual of instructions, which was to have consisted of a permanent double line, but it was never carried out, owing, it was stated, to "insuperable practical objections."*

The main object to be accomplished in constructing the temporary flying line was to get up a line in any manner whatsoever with the greatest possible rapidity. This was effected by using bamboos, or any form of cheap temporary wooden support available in the district. These poles with a groove cut in the top for the wire to rest in, were erected along the Grand Trunk Road, 50 ft. apart and 3 ft. in the ground. They were put up with remarkable celerity, an order having been previously issued, while the material was being prepared in England, to every magistrate to have the poles set up in the manner described by a fixed date, along such part of the Trunk Road as passed through his jurisdiction. By this means, an enormous existing establishment of Road inspectors, sub-conductors, police, and coolies were brought into immediate action, and on commencing to run out the wire in November, 1853, the poles were erected throughout the country. To further expedite matters, all the powerful resources of the Government were brought into play. The bullock train establishments, inland river steamers, commissariat, and public works departments throughout the country, were more or less placed at the disposal of the telegraph, and the result was as already narrated. The lines were completed with such wonderful celerity that even Europe re-echoed with astonishment. The most noble the Governor-General of India was elated; ambition was appeased; another of the many brilliant

* *Vide* Manual of Instructions, also Letter to *Englishman*, 24th of July, 1855, by Dr. W. B. O'Shaughnessy.

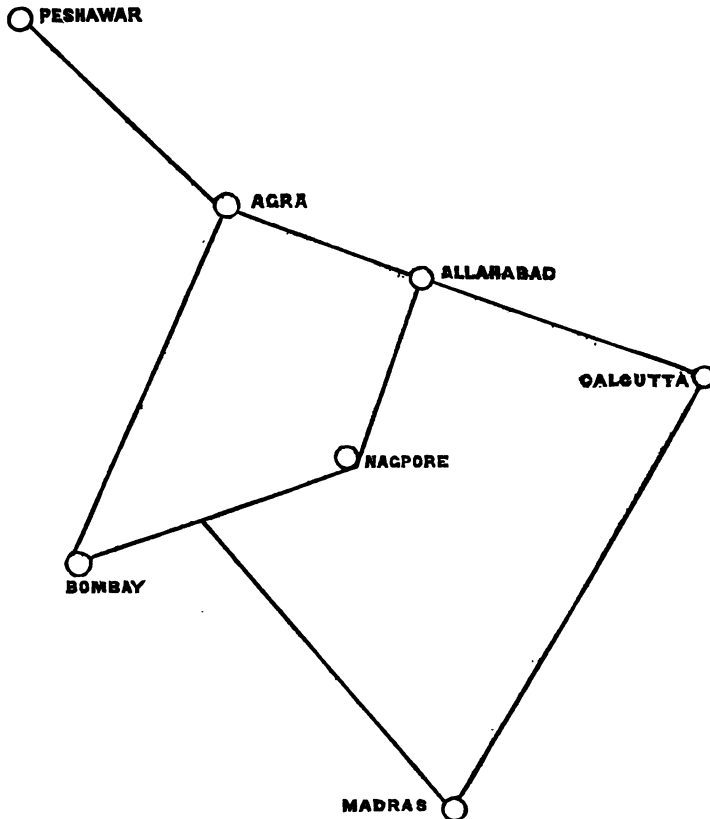
visions of a glorious rule was realised ; another achievement was added to the long roll of beneficent conquests which history would twine with lustre round his name ; honours and rewards were liberally showered around, and the Telegraph was inaugurated amid the joyous congratulations of rulers and the triumphant pæans of an empire.

Here the panorama changes. The stirring poetry of enthusiasm fell dead. The transient splendour of a too rapid and volatile triumph dissolved away. The ray of glory which burst upon the picture and lighted it up with dazzling brilliancy for a moment, was quickly o'erclouded and disappeared.

CHAPTER II.

PLANS PROPOSED IN 1850 AND 1852.

IN the Letter to the Chairman of the Court of Directors of the late East India Company, dated September, 1850, already alluded to,* it was suggested,



* *Vide ante*, Chapter I., page 2.

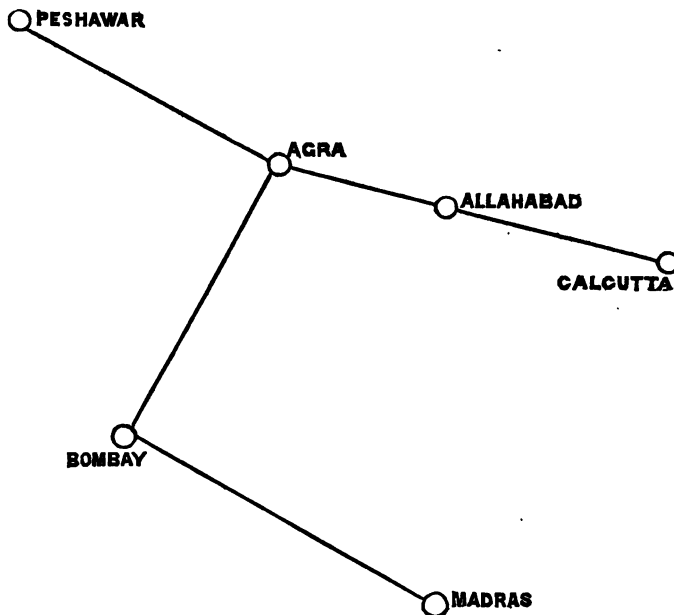
that in devising a scheme of telegraphs, "the best plan to be adopted in the carrying out of any system in India would be that known by the term 'circular system.'" The following lines were proposed:—A line from Calcutta to Allahabad, Agra, and Peshawar; another from Agra through Bombay to Madras; a third from Madras along the Madras Coast through Cuttack to Calcutta; and a fourth, through Central India, to form an additional cross connecting link between the Calcutta and Agra, and Bombay and Madras lines. Several branch lines were also included in the scheme.

The preceding sketch will illustrate the proposition. On recommending the above lines on the "circular system," it was advocated that the great advantages to be derived therefrom would be, that in case of any interruption occurring between Calcutta, Bombay, and Madras along one route, there would always be a second, and in some cases a third, route open. For instance, in the event of any interruption between Calcutta and Bombay on the line *viâ* Allahabad and Agra, a second route to Bombay would have been available *viâ* Cuttack and the Madras coast. "And so on, if any derangement occurred between any other two places." For as there would be in most instances "three routes available in case of one becoming defective, access could still be obtained to the desired point by either of the remaining two."

The plan proposed and adopted by the Government in 1852 will be understood by the following sketch. It consisted of a direct line from Calcutta to Peshawar, and a second direct line from Agra to Bombay and Madras.

The shortsightedness of this system was at once demonstrated when the mutinies broke out in 1857. The line beyond Allahabad was destroyed by the

mutineers, and the entire district between Allahabad and Delhi was in their hands. Communication between Calcutta and the seats of Government at Bombay and Madras was completely cut off at a most critical time. Then, and not till then, did the Government hasten to repair the oversight, and a line was run up along the Madras coast to Madras with all possible expedition. This line was completed about the middle of January, 1858, thus restoring the communication between Calcutta, Madras, and Bombay, which had been interrupted for seven months.* By the plan proposed in 1850, this long interruption need never have occurred. Subsequently, on the suppression of the mutinies, the cross connecting line through Central India was constructed.



* The erection of this line would have taken double this time had not the East Indian Railway Company handed over about 1500 miles of their telegraph wire to the Government.

CHAPTER III.

PHILOSOPHICAL EXPERIMENTS.

Preliminary Observations.

IT may be premised, that perhaps there is no part of the world under civilised rule which displays such a splendid field for telegraphic operations as India. It possesses many advantages commercially, theoretically, and practically—indeed, most of the elements essential to success are unusually predominant. On the other hand, the counterbalancing disadvantages are easily overcome. Yet, notwithstanding these highly favourable auspices, there is no part of the world which reveals such unexpected and incongruous issues; nor is there any country in which such diverse views have been entertained on telegraphic science. In the voluminous Government records will be found opinions and declarations at variance with the discoveries and experience of Western philosophy and advancement. Nevertheless, the substance of this antagonism must be measured by the result. That result is failure, as complete as it is deplorable; thus further establishing the truth, if it needed it, that the carefully determined laws and fun-

damental principles of science cannot be deviated from with impunity.

Instruments.

This subject has been more or less discussed throughout various reports, and, without going into any technical or mechanical detail, which would be more befitting a scientific dissertation, attention will be directed to one or two salient points of a general and easily intelligible character. It will be instructive to observe how light will sometimes gradually dawn upon the mind, and how opinions, when not based on sound deductions, will change according to time and circumstances. In paragraph 56 of the "Records of the Bengal Government," No. VII., will be found the following statement: "I accordingly tried and dismissed successively the English vertical astatic needle telegraph, the American dotter, and several contrivances of my own invention, most skilfully constructed by * * * of Calcutta. Every thunderstorm put the astatic needle *hors de combat*, by deranging the polarity of one or both needles. The American temporary magnets became permanently polarised, and ceased to actuate the markers. At length, by August, 1851, when incessant interruption of this kind had almost driven me to despair, I contrived the little single needle horizontal telegraph now in use in all our stations, with which we work in all weathers without danger of interruption." This was said in 1852. In 1855, when the public complain loudly of the shortcomings of the telegraph, the department is once more driven to desperation, and it is proposed to introduce "the American system and instruments of Morse, with some American hands to work them, by which our present line can transact over four times the amount of

business it can now perform.”* Thus the once rejected and condemned American instrument has supplanted all others, while in 1858 we find it overwhelmed with praises, styled an “admirable invention,” and the public are told that the little horizontal needle, once puffed up as the only invention adapted to the country, was merely “a makeshift, *pro tempore*!”†

Further, when the outcry was first raised against the “wretched instruments and imperfect system used on our lines,” the following defence was set up. “These” (meaning the instruments) “have been certified by the highest authority in England to be capable of conveying twenty words per minute, in first-rate hands, *on a single line*.” In order to substantiate this statement, reference is made to a report given at pages 130 and 131 of the “Indian Telegraph Manual,” and on turning to these pages and examining them very carefully, it appears that at an experiment which was tried at Dover in 1852, a telegraph clerk there “stated he could without difficulty communicate and read at the rate of twenty words per minute” on the Indian instrument. The highest authority in England, therefore, was a telegraph clerk at Dover.

With this certificate as to the capability of the Indian single needle instrument to transmit twenty words a minute, the report continues, at paragraph 58: “The English apparatus for a *double* line has practically only the same power, the average work being twenty-one and a quarter words per minute.” Without examining this statement and refuting it fully in detail, or exhibiting its fallacy by the side of the previous assertion,

* Letter to *Englishman*, 24th July, 1858; also First Report on Operations, &c., paragraph 42, p. 10.

† *Vide* paragraph 92, “General Report for 1857-1858.”

that Morse's instrument can work four times faster than the Indian, and consequently than the English, instrument, let it simply be assumed for the moment that both needles can be made to operate at the same speed, and how does the matter stand? On taking one of the overland bulletins, at the time consisting of 562 words, it was found, upon analysis, that the number of the vibrations of the needles necessary for the transmission of the whole despatch was as follows:

By the Indian single needle telegraph	8083
By Wheatstone's double needle	4906
Difference in favour of Wheatstone . . .	<u>3177</u>

Hence it appears that to transmit a message of 562 words, upwards of 3000, or considerably more than one-third, additional vibrations are necessary to be given on the Indian instrument than on the English one. Consequently, if we consider that the rapidity of execution is the same in both cases, it follows, *à fortiori*, that it would take one-third longer time to transmit a message by the Indian than by the English instrument. The co-efficient, therefore, is a *reductio ad absurdum*.

There is yet another point in connexion with this which requires notice. Scarcely had the Morse's instruments been paraded before the Indian public as the finest in the world, than another alteration was proposed, and that was to strip it of all its advantages as a permanent recording instrument (nowhere so serviceable for long through lines of communication as India), and to substitute fugitive signals. The instrument was divested of its tapper and paper wheel, and the signals had to be read off by ear from the sounds of the armature against the electro-magnet. This, which may be designated as an advancement towards retrogression,

www.libtool.com.cn

was carried out, and one of the many evil results is thus described in paragraph 16 of the "Report of the Director-General of Telegraphs," No. 3102A, 4th March, 1862, or about two years afterwards:

"Another impediment to automatic transmission in India has till very lately existed: I allude to the tying up of a certain spring fixed to the under side of the recording lever of the Morse instrument, and whose sole purpose was to render automatic transmission a possibility. The important part played by this spring in automatic transmission does not appear to have been explained to the assistants trained at Gresham House, by whom a knowledge of the Morse instrument was introduced into India; and as the spring in question, acting as a damper to the sounding lever, tended to render the operation of reading by sound less easy, the slight inconvenience which its presence caused was got rid of by tying it up, thereby preventing all motion in it, and consequently preventing automatic transmission through more than three or four stations, except at so slow a rate of signalling as to neutralise all benefits arising from the automatic transmission."

Insulation.

The question of insulation was, at first, the subject of much discussion in India, and some of the opinions hazarded at the time were astonishing. The theory propounded and maintained in various Government records was that, on long single lines of telegraph, insulation could be dispensed with. This theory, stoutly upheld, at first, by the scientific advisers of the Government, it is unnecessary to state, was in direct opposition to all theory and practice in every other part of the world. Refer to paragraph 33, page 9, Report 1857-8, it will

be found to be there stated, by erecting only one wire on our posts, we are enabled "to dispense altogether with insulation on the long single lines, as the experience gained on 7000 miles now in operation shows, that even the Morse instruments can be worked during the heaviest rain at longer distances than the average intervals required, which must be maintained for commercial, political, and military purposes." What kind of argument is this? Because stations are required for "commercial, political, and military purposes," at an average of 100 miles apart, are messages which require to be sent 400 or 500 miles to be repeated four times over along an uninsulated line, when along an insulated line they could be forwarded direct in one-fourth the time, and with seventy-five per cent. less liability to error? Besides, how does this statement bear inspection side by side with that at page 8 of the Report for 1855-6, where it is stated that, in consequence of much confusion prevailing on the Bombay section of the line, a circular was issued advising all habitual correspondents "to use the line as little as possible during the rains." Now, why was this? The instruments at that time were the more sensitive little horizontal needles, but now we are told "that even Morse's instruments can be worked." Then whence the greater cause for confusion during the rains than during fine weather? At both seasons of the year, the wires, posts, batteries, instruments, manipulators, and working regulations are the same.

But it is unnecessary to go so far as two years back, when there is a practical fact a few pages farther on in the very same report, contradicting this non-insulation theory. Turn to page 35 of the Report for 1857-8, and it is there written, "After closing the Bagoda office

efforts were made both from Raneegunge and Calcutta to work direct with Benares, but although some signals passed they were far too weak for any practical purpose, and the attempt had to be given up." Here, then, we are told that in August, 1857, during the height of the mutinies, when the repeating offices were deserted, at a most critical period in India's history, when the utility of the telegraph was incalculable, when every one was on the tip-toe of anxiety, for a period of fourteen days the telegraph failed to work from defective insulation between Raneegunge and Benares, a distance of about 300 miles—a distance which on the insulated lines of the Indian railways is easily and always worked, during all weathers, at a very small expenditure of battery power. Here, then, was a vital evil, palpably demonstrated so far back as 1855, and which in 1857 cut off all telegraphic communication throughout the whole of India for fourteen days, and even now, more than ten years afterwards, it is not remedied. At the present moment, and for the sixth time, an experiment is being tried, forced upon the Government by an indignant public.

It is strange that the great practical result, developed so far back as ten years ago, and which ought to have completely silenced the non-insulation theory, was blindly disregarded, viz., that from want of insulation frequent repeating stations have to be established at average distances of 100 miles apart during the rains or foggy weather. Hence a telegram from Calcutta to Bombay has to be repeated seventeen or eighteen times over, while one from Calcutta to Kurrachee must be repeated about twenty-five times. These numerous and unnecessary repetitions alone form a prominent and prolific source of delays and errors, and in some in-

stances occasion the disappearance of the messages altogether. This is quite unnecessary. Under a proper system, there need not be more than one or two repetitions between the above places, under all circumstances, and by the introduction of relays there need be no repetition at all.

But to whatever cause it was to be attributed, in spite of these convincing proofs, there appears in the Report for 1860 the following strange announcement: "From numerous and careful experiments made during the last rains it has been ascertained that electrical insulation is of very small necessity or importance even when many lines were on the same posts. After the first shower had washed off dust and the deposits from birds and insects, the subsequent falls of rain cause little or no division of currents from wire to wire. Distilled water, as rain is chemically, is, in fact, a capital insulator of voltaic currents of low tension, such as those we use for signalling purposes. The great object with multiple wires is to prevent their actual contact with each other. We are now introducing powerful screw clamps by which each wire is grasped tightly at every post, so that slipping off is prevented. The double line from Calcutta to Raneegunge, Benares to Allahabad, and Jellapore to Balasore are all being provided with these clamps; and other lines will be supplied when clamps arrive from England next season." It would be quite a waste of time to proceed to disprove the errors here set forth, especially as they are self-evident to all scientific men in England. Suffice it to say, that, with the usual curiosity to see a phenomenon, a gentleman made it a point to visit one of these experimental lines of about forty miles in length, and he found that in place of the two uninsulated wires being erected upon the same posts,

they were placed on separate lines of posts, one on either side of the road, about 500 feet asunder, as if they could not be separated wide enough apart. Upon inquiry he was informed that the two wires were originally suspended on the same line of posts, but owing to the constant contact that prevailed directly the rains set in interrupting the working, they had to be separated.

There is yet another contradiction in the same Report. At the fifth paragraph, subsequent to the one containing the statement that insulation can be dispensed with, it is stated that a new form of insulation had been invented, superior to anything hitherto known. If insulation is unnecessary, what is the use of inventing something new?

At length and at last, however, comes the magnanimous confession. The Director-General of Telegraphs, in his letter to the Secretary to the Government of India, No. 3102A, of 4th March, 1862, says, at paragraph 17 : " There is, however, a difficulty in automatic transmission peculiar to the Indian Government lines. These lines offer the only examples in the world of lines entirely devoid of insulation. During the rains the current, with the largest batteries that can be employed, frequently fails to produce decided indications on the relay of the next station. As a consequence, some of the beats at that station fail, and as such failed beats are omitted on the automatic transmission at the next station, and as additional beats are in each such onward transmission also left out, the result of automatic transmission through eighteen successive instruments, as on the line hence to Bombay, would not merely be to render the message unintelligible, but in extreme cases the message would, during transmission, entirely disappear."

Again, in paragraph 18 of a letter to the Secretary of the Bengal Chamber of Commerce, the Secretary to the Government of India in the Home Department echoes the foregoing, and amplifies it by alluding to the difficulties under which the department is labouring in the want of signallers, "and the system of non-insulation which has been bequeathed to it under a belief that insulation in India was practically unattainable."

The position is improving. First of all it is stated that on long single lines insulation is unnecessary; then comes the assertion that even on multiple lines it can be dispensed with, water being an insulator; then it is magnanimously confessed that the want of insulation is the cause of all the mistakes and delays throughout India; and, finally, it is declared that insulation was believed to be "practically unattainable." Well may Science veil her countenance, and blush with pity for her admirers.

CHAPTER IV.

INSULATION.

It will be interesting to review the various forms of insulation experimented upon.

1. The first method consisted of a cap of galvanised wrought iron, $8\frac{1}{2}$ in. high, and shaped like a common conical zinc mug, fixed to the top of the post by a cement of resin and sand. A wooden arm is fixed to the top of the cap by a screw-bolt, $\frac{1}{2}$ in. diameter. At both ends of the arm insulators are fixed, formed of brown glazed stoneware, in two pieces. The larger piece, which is cup-shaped and with a groove for the wire to rest in, is placed on the top of the bracket, and the smaller piece on the underside. A hooked screw-bolt, passing through the bracket, screwed up the insulators and wire together. It was originally intended for each bracket to carry two wires, but this was altered, and, by placing the bracket parallel with the line, the wire was fastened to a double set of insulators at each post. The plan was a failure. The principle was incorrect, the insulation bad, and the bracket fastenings so weak they were ripped off by the dozen whenever a storm swept over the lines, and the head-

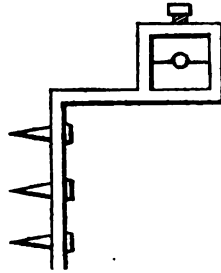
pieces might have been seen hanging on to the wire everywhere, supported by it in place of supporting it.

2. The next method was to cover the wire with strips of Madras cloth saturated in a melted mixture of tar, or pitch and sand, served on while hot, so as to envelope the wire for a foot on each side of the post. The wire was then either clamped by a hooked bolt to the post, or dropped into a groove on the top. This plan was very imperfect as an insulator, and could only have been viewed in the light of a temporary expedient, as it would require constant renewal.

3. The third plan consisted of a huge inverted glazed earthenware cup, cemented on to a galvanized sheet-iron hoop, of about 4 in. in depth, which was made to fit closely on to the top of the post, and then fastened by small screw-bolts. In principle this insulator was an improvement upon its predecessors; but the material of which it was composed was of a most wretched description, being little better than bad half-burnt brick, and so extremely brittle that upon erection it was speedily shattered to pieces and disappeared.

4. Upon the failure of this insulator (an immense number of which were sent out from England), a novel form was invented by the head of the department. It was styled "a simple and cheap contrivance, of great mechanical strength, by which absolute electrical insulation is obtained."* It consisted of two pieces of wood boiled in oil, with a groove for the wire to rest in, and then clamped together on an iron bracket fastened to the side of the post. The wire was tightly clasped between the two bits of wood by an adjusting screw, something in the annexed fashion. The "great mechanical strength" of this insulator resulted in deplorable

* *Vide* paragraph 38, Report 1857-58.



mechanical weakness, for the wrought-iron brackets broke off at the elbow on the first storm that passed over the lines, and a new and stronger form of cast-iron bracket was substituted. The "absolute electrical insulation" expected to be obtained from the "two pieces of wood boiled in oil" was put to the test directly the rains set in, and failed completely. On the Ranee-gunge section of the line, on which two wires were erected, there was such constant contact produced that the invention had to be abandoned, and the old plan of wrapping tarred cloth round the wires was again resorted to. It must be remarked that, notwithstanding that the introduction of this insulator was heralded with an official flourish of trumpets, its failure was predicted at the first. It was simply absurd to imagine that a piece of wood, a twentieth-rate insulator, combined with oil, a fortieth-rate insulator (the worst of all insulators next to metallic oxides), and surrounded by a band of iron (an excellent conductor) should produce an insulator that was absolutely perfect. And this brilliant invention was the crowning triumph of "twenty years' experience, with such extensive opportunities for gaining practical knowledge as no other individual has ever enjoyed." *

5. The fifth experiment consisted of a cast-iron cap,

* *Vide* paragraph 36, Report 1857-58.

into which an insulating block of gutta-percha was placed, through the centre of which passed a spike, to fasten the insulator to the post, the whole being cemented together with sulphur. At the bottom of the insulator an outer projecting rim was placed, to carry off the rain or deposits of dew or moisture. In spite of 108,000 of these insulators being sent out about a couple of years ago, it is, perhaps, unnecessary to add that, being altogether wrong in principle, they failed as completely as their predecessors.

For the sixth time the Government, aroused by the public outcry, have just sent out an immense number of insulators of another pattern, the chief feature of which is a cast-iron cap, as before, the arrangement of the internal insulating material being modified. It is earnestly to be hoped that, after five unnecessary successive failures, and the contingent outlay of capital, these indomitable and persevering efforts in the pursuit of knowledge under difficulties may at last in some measure be rewarded.

CHAPTER V.

CRISES AND TENTATIVE REFORMS.

IN proceeding to notice this part of the subject, attention will only be drawn to the various periods when the complaints against the mismanagement of the Indian lines became so violent that the Government were forced to interfere. A cursory allusion, however, must here be made to the fact that there was always a constant ferment on this question ; for the "lamentable inefficiency" of the lines was a source of chronic irritation. Nevertheless, leaving this aside, a brief review of the various crises of dissatisfaction, with the reforms attempted, will afford valuable instruction.

It is necessary to notice this in order that the public may be placed on their guard against being once more deluded by visionary hopes and nebulous promises. It was only a few months back, when the outcry against the Indian telegraph had reached a climax, that a gentleman connected with the India Office was heard to say, "It is all very well to abuse us so, but we shall do better next year." Now, with all due deference to that prophetic announcement, which may be of the utmost value, the public cannot otherwise than receive it with

very considerable reservation. And why? Because "better next year" has been the constant theme for the past ten years. Every time that the public have been lashed by their sufferings to adopt vehement proceedings, the Telegraph Department, awakened by the uproar to a sense of their position, has again and again hushed the increasing tumult by numerous promises of reform and amendment, blandished by a few messages like the late Bhootan telegram, or the still more recent one about the Finance Minister's budget, flashed through with more than ordinary rapidity. But all attempts hitherto have proved temporary and fluctuating; no permanent result has ever been achieved; for after a slight respite everything speedily relapsed into its usual state of delay, error, and irregularity.

Take the first of these surges of popular indignation, which occurred in 1856, shortly after the opening of the telegraph to the public. After a mass of investigation, explanation, and recrimination, in which the unfortunate subordinates in India were unjustly treated with more than their full share of blame, the following remedies were proposed: "The introduction of Morse's instruments, with American hands to work them, is the measure to which I give the preference as the most economical, prompt, and certain of any which could be adopted. If this be deemed inexpedient, the gradual conversion of the whole establishment into a strictly military organisation will, I believe, be found the best alternative."* The first of these suggestions was adopted; the once-rejected and condemned Morse's instruments, with English signallers on higher salaries, were introduced, and iron poles, insulators, and other

* *Vide* paragraph 42, page 10, First Report on Operations, 1856; also Letter to *Calcutta Englishman*, 24th July, 1855.

minor reforms were also carried out simultaneously. The public, for the time being, were satisfied, and patiently bore the disadvantages under which they were labouring, in hopes of the promised improvements sooner or later becoming effective. Upon their introduction (which occupied a long time, as all the material had to be procured from England), a slight amendment was visible, but it was of short duration. Murmurs were soon again heard, and these gradually grew into loud and reiterated complaints, the position once more became intolerable, and in 1861 the Government had again to interfere. A commission was appointed to investigate the matter, and their report was forwarded to the Director-General of Telegraphs, who replied to it with voluminous explanations, and the question was once again shelved with the usual promises of reform, accompanied by the customary blandishments. This time the evils were mainly attributed to low salaries as before, and want of insulation; so insulation was promised, and the entire department reorganised on better pay, while their vanity was cajoled with a few loud-sounding titles.

Here is the official winding-up of the question on this occasion: "The absence of insulation of the wires is referred to as one of the difficulties to be contended with in India in the correct transmission of messages. The question of insulation, I am directed to state, will be brought to a practical test as soon as the new insulators now expected from England arrive. It is, however, freely and fully admitted by his Excellency in Council that there is great room for improvement, and that instances of messages delayed, misdelivered, and inaccurately or unintelligibly rendered are of much more frequent occurrence than they ought to be. The esta-

blishment has recently been organised and placed on a better footing as regards pay and promotion, and the Government relies on * * * * * and the higher officers of the department to use the utmost care and vigilance in preventing mistakes, &c., and to endeavour unremittingly to make the telegraph thoroughly efficient by promptly remedying such defects as can be corrected with the means at their disposal, and by suggesting to Government all other practicable measures required for the purpose."*

The insulators above alluded to, of which 108,000 were sent out to India, turned out a complete failure, as was predicted before they left this country. The other remedies also failed to produce the much-desired permanent amelioration. Complaints soon again rise to the surface, once more the Indian Chambers of Commerce reiterate their too-oft repeated animadversions, but apparently without much effect, until ultimately the opening of the Persian Gulf line during the past year produced a collapse of the entire system, and unveiled a picture to the gaze of the British public as novel as it was unpleasant. The Kurrachee Chamber of Commerce has now added its dissentient voice to the list, and public opinion has grown unanimous on the eccentricities of the Indian telegraph. The Kurrachee Chamber, however, talks of delays of only thirty to sixty hours between Kurrachee and Bombay, which is quite refreshing after Madras or Calcutta merchants have been waiting for nine, ten, to eleven days sometimes for their telegrams. The following, from a recent number of the *Indian Times*, gives a case in point :

* *Vide* paragraphs 14, page 102, and 19, page 103, Report for 1861-62 ; Letter from Secretary to Government of India, Home Department, to Secretary Bengal Chamber of Commerce, 15th January, 1862.

“ Within the last few days we have received a telegram from Calcutta which occupied nine days in transit, and another which took eleven days, two from Madras, which occupied eight days each, and one from Colombo, which took seven days.”

The Madras Chamber of Commerce, too, in a letter addressed to the Government not so long ago, speaks of the lines in Southern India “being in a chronic state of interruption.” Where the outcry is so universal, emanating from every part of India, there must be some truth in the dissatisfaction evidenced. And this view is supported by official documents. It is unnecessary to go to the public to substantiate their charges, for the Telegraph Department condemn themselves in their own despatches, *passim*. Turn to paragraph 103, page 67, of the Report for 1861-2, and you will find the Director-General of Telegraphs says thus: “In illustration of the delays occasioned by bad weather, I may mention that whereas twelve words per minute, or seven hundred and twenty words per hour, can be sent in the ordinary course of working during fine dry weather, it frequently happens that but one-fourth of that number, or one hundred and eighty words per hour, can be sent when communication is rendered imperfect by wet weather.” That is to say, that the working capacity of the Government lines is equivalent to three words per minute for five months in the year, capable of being increased to twelve words per minute for the remaining seven, when working at its best.

Again, the officiating Director-General, in his letter of 3rd December, 1861, states:

“I would wish to say a word here on the subject of imperfect communication and its causes. By imperfect communication is meant that, owing either to the

absence of insulation, or defective insulation, or to unfavourable weather, or in case of lines well insulated to deposits of moisture on the insulating surfaces resulting from an excessively damp state of the atmosphere, a loss of the electric current occurs, and it is found impossible to send to the distant station a current of strength sufficient to affect the receiving instruments there with that certainty necessary for uninterrupted correspondence. In such case some of the dots and bars composing our letters, as it were, drop out, and the word of which they form a part is rendered unintelligible, or it may occur from the same cause, a letter becomes split up into two, producing similar confusion."

Here follow some extracts, by way of vindication, from Prescott's "Theory and Practice of the Telegraph," to show that such things occur in America. This is not the first time that the Indian telegraph has flown to America when at a loss for defensive weapons. Nor is this all; for a little farther on the matter is more clearly defined. If we refer to page 63, of the same Report, we will there find a statement in detail of all the interruptions throughout India during the official year in question. Upon a careful analysis of this statement, it appears that there was a mean of one hundred and thirty interruptions throughout the whole of India, of an average duration of thirty-six hours each, making, at twenty-four working hours in the day, a total of one hundred and seventy-eight days, *i. e.* more than one-half the working year, omitting Sundays. This is truly retrograding to the dark ages of telegraphy. The old exploded semaphore telegraph of fifty years ago worked with equal efficiency.

What then are the remedies now being proposed to improve this miserable state of affairs? Precisely a re-

petition of what has been done before. A quantity of new insulation and other material is being sent out to India. The department is about to be reorganised, with increased salaries, embroidered coats, and an enriched nomenclature. Here is the new programme as described in the *Calcutta Englishman* of the 14th February last :

"The Supreme Government have sanctioned the new arrangements for improving the efficiency of the department. These arrangements consist chiefly of a liberal increase of salaries, measures for removing extra friction, simplifying and obtaining a prompt audit of accounts, and incessant patrolling and supervision of lines and offices." The *Englishman* then goes on to say, "But the Director-General has impressed on the attention of every member of the department, that this new scheme has only been sanctioned as an experimental measure, and on the distinct pledge of the Director-General, that these changes shall produce that amendment which is so much desired by all concerned.*

"The Director-General feels confident that every officer of the department will give him his earnest co-operation in redeeming this pledge, and that with their aid the Telegraph Department will soon be as remarkable for its efficiency as it has been hitherto unfortunately, and probably unjustly, considered the reverse."

* * * * *

"The general measures for improving the signallers are to give them better pay, better furnished quarters, a uniform, and to allow them to indent on the commissariat for rations. Assistants in charge are to be called Telegraph Masters ; and the deputies, Deputy Telegraph Masters."

Certainly, if an alteration to sonorous titles, with

* A slight variation on what was said in 1861, see p. 27.

increased salaries, is to produce an improvement, the above measures may probably effect it. But what are these professions but the exact counterpart of what has been tried before? It is precisely the same old futile story of four years back, repeated with embellishments. The gist of the programme is unchanged.

At the same time, there is a gleam of hope in the concluding sentence :

“The Director-General desires,” he observes, “to see the signallers so comfortable and well located, that they will prefer remaining in the offices to wandering in the bazaars ; that they may, in fact, feel at home in their offices. He will therefore be much obliged for suggestions, and most happy to afford his support to any practical scheme for forming small libraries and other simple means of amusement.”

It is well known that the simple falling of an apple led the great Sir Isaac Newton to discover the revolutions of the heavenly bodies and solar systems. Even so, perchance, in this diligent attention to minute objects may be seen the omen of a grand result. Apparently we are at last on the eve of the long sought-after and brilliant discovery of the revolution of human bodies and the Indian telegraph system.

Such then is the unaltered programme, and the result remains to be developed. Where similar previous attempts have ended in failure, and where former promises, made and repeated years ago, are still where they were then, *in nubibus*, the natural conclusion is inevitable. The *Calcutta Englishman* of 14th February last, while commenting on the subject, most justly says, “Something more than the new arrangements referred to in a preceding paragraph is required to place our telegraphic system on a satisfactory footing.” The

Calcutta correspondent of the *Times*, of the 26th March, while noticing the programme, winds up his remarks with a sort of melancholy despair, that "no material improvement in the present wretched system is expected."

It would seem, also, that even the Director-General himself rather hesitates as to the success of some of his propositions, for while he states, "I am sanguine that the scheme that I have submitted will work well," in the very next line he says, "I have some doubts whether the abolition of Directors may after all prove beneficial."

Nevertheless, to give the department whatever is its due, the *vox populi* has once more made itself felt, and we have a momentary spasm of improvement. The Chairman of the Calcutta Chamber of Commerce, in his speech of the 13th December last, says, "It must be added, also, that there has been lately a marked improvement in the speed with which English messages are transmitted over the Indian lines." This refers only to English messages: the praise is qualified. What of the Indian messages? And how long is this qualified approval to last? A month, two months more? and are we then to have the usual subsidence? Already the shadows are beginning to fall; they will soon lengthen and deepen, as sure as night succeeds to day. Listen to what the *Englishman*, of two months later than the above faint praise, says,

"There is not a firm in Calcutta, perhaps not even a private person who has resided long in the city, who has not his tale of inconvenience and wrongs suffered at the hands of the Telegraph Department." * * * * "No one ever expected to keep the wires up in the cyclone, and all reasonable men will suffer the inconveniences which result from similar accidents in silence; but it passes endurance when, without any cause whatever, letters from Bombay come quicker than telegrams, or when a telegraph office clerk at Allahabad states that he never heard of such a place as Bankipore." * * * *

The remarks then wind up with the following despairing announcement: "We suffer simply because we will not be at the trouble to protect ourselves." Therein lies the lamentable truth and explanation of how the Indian community have allowed themselves for ten long years to be deluded and victimised.

Yet in spite of all this, assuming that the measures now being adopted are at last correct, and will lead to gratifying results and the establishment of an efficient and reliable system satisfactory to the public, it may be asked, of what value is that system which has shown itself hitherto, on more than one occasion, incapable of anticipating and keeping pace with the enterprising, scientific, and expanding spirit of the age, and which has periodically to be goaded on by ebullitions of public indignation, to spasmodic and uncertain experiments at improvement and reorganisation?*

* Since the foregoing was in type, the *Bombay Times* has published the following statement, which verifies the views enforced in this chapter. "The wretchedly inefficient working of the line between Kurrachee and Bombay during the period under review, will be seen from the following compilation from the daily reports supplied by the Indian Telegraph Department itself:—

From Kurrachee to Bombay.

Date.	Maximum.			Minimum.		
	Days	hrs.	mins.	Days	hrs.	mins.
1866 February 1st . . .	4	3	31	2	11	39
2nd . . .	2	15	56	2	15	14
3rd . . .	2	18	46	2	9	38
4th . . .	2	13	40	1	20	34
5th . . .	1	19	23	1	4	47
6th . . .	0	22	8	0	4	39
7th . . .	0	9	3	0	6	35
9th . . .	2	4	5	2	3	10
10th . . .	2	7	27	2	4	15
11th . . .	3	3	17	2	3	0
12th . . .	2	4	10	2	0	39

"Only on two days does the line appear to have been even approaching proper working order, while for several days subsequent to the 12th, the line was closed for all local traffic." The mean average speed was therefore 1 day, 20 hours, 32 minutes, the distance being about 860 miles.

CHAPTER VI.

THE TELEGRAPH ACTS, XXXIV. OF 1854, AND VIII. OF 1860.

IN December, 1854, the Legislative Council of India passed an Act, No. XXXIV. of 1854, for regulating the establishment and management of Electric Telegraphs in India. Six years later this Act was slightly modified and re-enacted as Act VIII. of 1860.

By this Act the Government claimed the exclusive privilege of establishing lines of telegraph throughout India, and prohibited their erection and use without a licence. The penalty was a fine of 100*l.* for erecting an unlicensed line, and 50*l.* per week for every week such line was maintained, and a further fine of 5*l.* upon every person, for every time he used it.

The reasons assigned at the time for departing from the course adopted in England, and placing the telegraph under Government control as on the Continent, were because it was done on the Continent and not in England; and because, as the Government would erect the telegraph at its own cost, it had as much right to prohibit competition "as it had to prohibit the convey-

ance of letters otherwise than by the Government post, provided the public are allowed the full use of the telegraph." * It was also believed that it would be more advantageous to a country like India, "where uniformity of management is of great importance, and where the circulation of false and inaccurate information, either from design or accident, should be specially guarded against, that the telegraphic operations should be conducted exclusively under the control of Government." †

The Government, then, having claimed the right of the exclusive use of the telegraph in India, it follows that the onus of providing the public with every facility has rested entirely with themselves; for it would be manifestly unjust to say that any ruling power can monopolise the most useful system of intercommunication, and yet so far neglect their duty to their subjects as to virtually debar them from all its benefits. Practically, this has been the result. The telegraph has been erected exclusively for political and State purposes. The public have been treated with but secondary consideration, their requirements have not been studied, their wants have not been supplied. A solitary uninsulated wire is certainly not sufficient to meet the demands of one hundred and fifty millions of people, nor the requirements of an external and internal commerce of one hundred and twenty millions sterling, extending to every quarter of the globe.

True, yielding to external pressure, the Government have of late years invited the public to come forward and establish a line for themselves; but the offer has

* See Minutes by the Most Noble the Governor-General, 20th May, 1853.

† *Vide* Public Despatch of Court of Directors to East India Company, 17th June, 1854.

been a negative one, and the accomplishment of that end has been hitherto frustrated.

It will be well to examine into the reasons assigned by the Government for establishing and maintaining the monopoly.

It must be premised that it will be foreign to the discussion, and only begging the question, to instance the practices adopted in France and other continental nations in order to support and countenance a restrictive and injurious policy. If Englishmen, especially in India, are to take the principles and practice of other nations as their guide, upon the shallow plea of imitation, then it will be equally justifiable and meritorious to adopt any foreign measure, however repugnant to enlightened principles, simply because it is foreign. It has long been the proud boast of an Englishman, that his native land has held the foremost rank in promoting enlightened government, and urging on a progressive civilisation, and must he, particularly in India, forego his nationality, and advocate or adopt the special policies of other countries, which tend rather to impede than accelerate progress?

Nor is it a question for class legislation. There are no antagonistic prejudices of caste or creed to be reconciled. The electric telegraph is an application of science to art, given alike for the good of mankind, and its use ought to be free and unrestricted.

Setting aside State reasons, it would appear that if the monopoly principle were justifiable in this instance, it would be equally just to pass an Act monopolising to the Indian Government all railways, roads, dawk companies, bullock trains, inland steam navigation, and, in fact, every other mode of internal communication, fast or slow. The tacit acceptance by the Indian public of

the terms of the Telegraph Act, can only be accounted for by the fact that it was a new thing, and no one in India knew anything about it, nor had any idea of the ultimate consequences of its stringent clauses.

Sweep over the entire field of arguments that have been advanced in favour of a monopoly, and not one of them will bear close inspection. It may be urged that where the interests of the proprietor are likely to clash with those of the people, State control is necessary. The State controls railways, because careless management, or the folly of proprietors, might endanger the public safety. The State also ought to have some control over telegraphs, because, being the most rapid means of intercommunication, they, in cases of urgency, virtually supersede the railway and the post-office as a means of communicating intelligence, and become a most powerful engine for good or evil. The force of this argument must be admitted in one sense, but there are two meanings to it. It is one thing to exercise a healthy State control—no one objects to that; but it is quite another thing for the State to monopolise. It would not be one whit less absurd for the State to say to a railway company, "You shall take this passenger, but not that," than it was for them to say, as they did until very recently to the railway telegraph, "You shall take this message, but not that." Nor would it be any less absurd to say, by way of analogy, to a joint-stock bank, "We shall not allow you to do any business in India, because we have established the banks of Bengal, Madras and Bombay as Government banks, and shall compel every one to bank with us." There is a broad line of demarcation between the wise principle of a healthy State control and the injurious limits of a restrictive policy.

Further, it may be argued that for State reasons, in

a country like India, where the victor rules over the vanquished ; where the Government is established, not by right of birth, but by the might of the sword ; where the conquerors and conquered are alien races, differing in creed, colour and civilisation ; it would be dangerous to the State if such a powerful engine as the telegraph were not exclusively in Government hands. Private telegraphs might be made the means of secretly circulating treason and sedition, and aiding and abetting schemes for the overthrow of the dominant power. Omitting all allusion to the well-known antagonism of the numerous creeds and religious sects throughout India, scattered over vast areas, rendering unity of action in one common cause impossible, this argument is opposed to all reason, and is refuted by facts. It is a fact that, when treason was sown broadcast throughout the land, it was disseminated by far more effectual means than the telegraph could ever have afforded for secrecy and design. It is a fact, also, that during the mutinies the first action of the rebels was to cut the wire and render it useless. They went even farther, for, when short of ammunition, &c., they cut it into pieces for slugs and ramrods. It is a fact, too, that the same plan was adopted by Garibaldi's patriotic little band, for, immediately on their landing in Sicily, they cut the wires and paralysed their power. It is also a fact, substantiated during the late wars in Europe and America, that the telegraph is only of use in the rear of contending armies, and that in the intervening space which separates them, it is worthless, because destroyed. Moreover, the argument is remarkably transparent. Any one who knows anything at all of telegraphy must know that by judicious administration no such prostitution of the telegraph could occur, and even assuming that such an

attempt were made, it would easily be thwarted on the threshold. This argument, therefore, is fallacious.

On the other hand, the converse may be shown to be true. Had there been two telegraph systems passing along different routes, between Calcutta, Madras, Bombay, and Galle, that long interruption of seven months between Calcutta and Bombay, during the mutinies, would never have occurred; nor would we have had the great opium forgeries,* for one telegraph would have checked and corrected the other.

Again it may be argued that the Government have expended large sums of money to establish a system of telegraphs throughout India, and it is hardly possible that they can allow rivals to enter the field and work in opposition to themselves and injure their position. There might be some colour to this plea, if the Government telegraph was so perfect, that it was never interrupted, seldom if ever gave cause for complaint, and was worked to the complete satisfaction of the public—every exertion being made to anticipate and meet their ever increasing demands. But is this so?

Nevertheless, the answer is simple. First, as regards the railway companies.

The railway companies have, in accordance with the terms of their act and bye-laws, been compelled by the Government to erect telegraphs for the public safety. The money expended upon the railway telegraph is raised by a five per cent. Government guarantee. The money expended upon the Government telegraph is also raised by Government paper bearing five per cent. interest. In a broad commercial sense, then, the money spent on the two undertakings is raised in the same way on a Government guarantee, the only difference

* *Vide* Appendix.

being that where, in the one case, the money is spent directly by the Government, in another it is expended through the medium of a private company. Further, speaking in *one* sense, there is virtually no difference whether the telegraph receipts be credited to the Government through their own telegraph department, or through the telegraph department of the railway company. Yet, in another sense, there is this marked difference: the Government paper bears five per cent. interest, and can never bear more; while, on the other hand, the railway shares, though guaranteed five per cent., may pay a higher rate. It is of no consequence to the holders of Government paper whether the telegraph pays or not, it does not affect their dividends at all; but it is of consequence to the railway shareholders to reduce their telegraph expenses to a minimum, because it will eventually affect their dividends, though it be but on a small scale. The railway companies were compelled to erect telegraphs, though it was no part of their original contract with the late Honourable East India Company; therefore it would be an injustice to the railway shareholders to prevent them from using their telegraph to the best advantage. Besides, see how the public were inconvenienced thereby. The railway company have been compelled to say—"It is quite true we are placed here expressly for the service and convenience of the public; we are even compelled by the Legislature to consult your wants and convenience in every possible respect, yet at the same time we are constrained by other Government orders from so doing. You may go and make your arrangements, say with the station-master at Burdwan or Raneegunge, about despatching your goods; but if you want to send a message to your agents in Calcutta about them, you

must not go to our office next door, but you are compelled by the Government to go to their office, a couple of miles or so off." In the case of Benares, it would have been no less than six miles off on the other side of the river.

Now, then, let us consider the subject as concerns a telegraph company, independent of any financial connexion with the Government.

The reply on this point must be based on the fact that a monopoly of any means of conveyance is in direct opposition to the welfare of the public, and the never-ceasing developments of trade and commerce ; and further, that a little wholesome competition will be attended with the most beneficial results, alike to the Government as to the public. In maintaining this hypothesis, let us revert to what occurred in England on the discovery and introduction of the telegraph.

When the telegraph was first invented, the patents were bought up by a private company, who thus obtained the monopoly of all telegraphs in England. In order to continue this monopoly in their own hands, this company purchased up every new patent and every new invention as it came out, thus closing the door against competition. By this means the monopoly was maintained for several years ; but so wretchedly was the telegraph conducted, so little was the attention paid to the interests of the public, and so loud and reiterated were the complaints against its mismanagement, that other private companies started. No sooner were these companies in the field than the original Telegraph Company at once commenced a series of sweeping reforms. All their principal officers were changed, a more liberal and energetic policy was adopted, their lines were extended in every direction, improvements were instituted, and,

in a very short time, a vast change for the better had taken place, and the business was soon brought to a high state of efficiency. The original company knew full well that where there were competitors in the field, unless they kept pace with the times, and showed themselves worthy of public favour, they could not make, much less maintain, their position. The result has been, that not only have they made and maintained their position, but they have far outdistanced their rivals, and enjoyed a prosperity they never knew before. The anticipated evil which frightened them at first has in reality turned out of the greatest possible advantage to the public at large, as well as to themselves financially. England now possesses a system of telegraphs unrivalled in the world for their accuracy, efficiency, and expedition.

In the same way a healthy competition would be of the greatest possible service to the Government and the public, nor will the Government be doing their duty to themselves nor their subjects if they ignore that principle of fair and honest emulation.

Possibly there would be less force in this reasoning if the Indian telegraph was in a most perfect condition. If it was in the highest state of efficiency, and remarkable for its wonderful expedition and accuracy, as well as for the unremitting attention paid to public interests, there might be some ground in favour of a retention of the monopoly. But is it not a notorious fact that the Indian telegraph anything but approaches to this standard of perfection; and, further, that it is essentially a Government telegraph, the public being considered rather as a nuisance in place of a support? Such being the case, why, like a dog in the manger, prohibit others from running their chance of getting

what they can? Moreover, do not such stringent measures imply an acknowledgment of their own inferiority, and betray a weakness unbecoming the august dignity of a ruling power? If the Government were confident of their own superiority—confident in their well-established position, their extensive and valuable mercantile and commercial connexions—confident that no one could excel, though they might equal, them, they could afford to repose quietly, and treat with indifference the attempts of those who would fain emulate them. The converse, however, being the case, the result is undeniable.

But there is one other correlative argument which may be advanced in defence of the interests of the public, and that is the great expansion of our Indian trade and commerce since the introduction of free trade, and the final relinquishment of all mercantile transactions by the late Honourable the East India Company. Take the trade of Calcutta, for instance. Soon after the introduction of free trade, in 1814, the tonnage of the port rapidly increased by one-third. But mark the still greater effect since the year 1833, when the East India Company finally relinquished all connexion with mercantile pursuits. The trade of the port then increased with such marvellous rapidity that it nearly doubled itself during the first ten years, and then went on redoubling itself through each successive decade, thus:

Year.	No. of Ships.	Mean Tonnage.
1833	372	138,012
1843	599	258,695
1853	904	424,880
1863	1126	910,296

And during the past year it exceeded a million tons. Surely this is a conclusive argument, if any were

needed, against the continuance of a commercial undertaking and means of public conveyance like the telegraph exclusively in the hands of the Government.*

It is to be hoped, then, sufficient cause has been shown for the exercise of a more liberal and enlightened policy on this question than heretofore. Both precedent and experience point out such a course as imperative. It is trifling with the subject to suppose that with a commerce equal to nearly one-half the commerce of this great and wealthy nation, and with a population five times as numerous, the necessary requirements can be adequately supplied by a solitary wire, or even two wires, which, after all, would be only equal in capacity to one. Imagine the commerce of England only a moiety of what it is, think you the public would be satisfied with one or even two wires, and these in the hands of the Government, who virtually tell the public we shall give you no more, nor allow you to supply

* There are some people to be found who even go so far as to advocate the telegraphs in this country being placed under the control of Government, and they talk of free trade in telegraphs (as if we had not got that already), and they point to the successful management of the Post Office in this country in support of their views; and they imagine they are clinching the argument when they point again exultingly to India, and say, "Look at the glorious success of the telegraph there, where it enjoys free trade, and where it is exclusively a Government institution." Let those who entertain these views gaze on the picture disclosed in these pages, and then form their opinions. Besides, to instance the success of the Post Office is no argument, and those who use it forget entirely one point—they forget that the Post Office merely performs the ordinary routine work of collectors and distributors of letters, which duties call for little changes, while all the carrying from place to place—that which is ever changing, ever advancing, ever improving—is performed by the public. If the Government, which is always tardy in adopting improvements, and seldom does so until forced into it, had to provide all their own means of conveyance, and keep pace with the improvements of the day, would the service be as well performed? Further, you may carry a thousand letters by one train, at the same time and at the one cost, but you cannot, in the present state of telegraphic science, send even two messages along one wire at one and the same time for the one expense.

yourselves? To use an old homely northern adage, the Government "will neither dance themselves, nor hold the candle;" they will not themselves undertake those comprehensive and elaborate measures which are indispensable to place the telegraph in India on an efficient commercial footing, nor will they let others do it. Perhaps it will be said, "Yes, but we are doing something now." The counter reply to that is, that a tentative something is being done which has already been attempted more than once before, and which has signally failed. Like the physician who has encountered a disease which baffles all his skill, in blind faith precisely the same remedies are still being experimentally applied which have already killed off half a dozen patients.

Whoever has carefully examined this question can arrive at but one conclusion, viz. that to perpetuate the policy that has hitherto been pursued with the Indian telegraph, is to drag on a narrow and ruinously expensive process; to limit the utility of an invention acknowledged by all as the greatest gift ever bestowed by science on the useful arts; to oppose the external and internal wants of a wealthy and populous empire; to frustrate the growing requirements inseparable from the introduction of improved means of internal communication; to paralyse the absolute necessities of an expansive and daily expanding commerce; and, finally, to obstruct the imperative demands of progressive science and civilisation.

CHAPTER VII.

ARGUMENTS IN DEFENCE OF MALADMINISTRATION.

THE arguments advanced in defence of the complaints against the maladministration of the Indian lines, are :

1. That the complaints bear but a small proportion to the number of messages despatched, being, according to the latest published returns, 0.287 per cent.

This argument will certainly not bear the test of examination by the side of official documents. Paragraph 108 of the Report for 1857-58 runs thus : "The Deputy Superintendents sent in a weekly tabular statement, professing to show the total number of messages, their number of words, exact number of errors, this with great apparent precision to the fifth decimal place ; what degree of reliance was to be placed on such reports may be judged by the fact, that soon after my arrival in Bombay, I took sudden possession of the examiner's records, and found that for more than six months the returns had been a mere sham, the detailed reports had seldom or never been read, and several hundreds were found still in the unopened envelopes." Again, the Governor-General of India evidently disapproved of the argument in the official announcement : "The Governor-General in Council by no means concludes that 139 represents the real number of messages in which mistakes

occurred in 1860-61.”* A further exposition of the fallacy of the returns was given at a meeting of the Bombay Chamber of Commerce in February, 1861, on which occasion one merchant stated that out of 1200 messages received during the past year, hardly one was correct; and yet, according to the official report, there were only 400 complaints that year. Moreover, it is a notorious fact that the public, when they receive erroneous and unintelligible messages, prefer to bear and suffer, rather than go to the trouble of lodging a formal complaint; and they seldom do so, unless driven to it by some pecuniary loss. Even so recently as last October, the Director-General says of the complaint office, “In fact, the fault office only exists in imagination, the only faults discovered being those brought to light in tracing complaints.” And this is how the cash receipts are checked. “It is only a few months since that several months’ of cash collection audit were jumped over (skipped), and the cash-checking commenced again with a clean bill from a fresh date.”

The second argument is :

2. That the Indian lines are no worse than the lines in other countries, where none are perfection.

This defence is stultified by the acts and admissions of the Government executive. A circular is issued advising all habitual correspondents, especially on the Calcutta and Bombay line, owing to the confusion that prevails, to use it “*as little as possible during the rains.*” All correspondents are also advised to have their telegrams insured and repeated (for which there is an extra charge of half price additional), otherwise their safe and accurate transmission cannot be secured. A general complaint office is established in Calcutta, with a well-

* Page 103 “Moral Progress of India, 1861-62” (Parliamentary Return).

paid official at its head, a necessity unknown elsewhere; and lastly, a classified statement is published exhibiting all the interruptions all over India during the year, a careful analysis of which, according to the annexed table, shows that throughout the whole of India during the year 1861-62, there was a mean of 130 interruptions of an average duration of thirty-six hours each, making with eighteen working hours to the day, 233 days, or two-thirds of the whole year. Thus the electric telegraph in India of the present day is inferior to the long-exploded semaphore telegraph of fifty years ago, which was abandoned mainly because it was interrupted by fogs and rain for a great part of the year. It might be asked here, as pertinent to the subject, if the operations of the Electric and International Telegraph Company in this country were completely paralysed for two-thirds of the year—shut for four out of six days in the week—where would their last 9 and 10 per cent. dividends be, and what would the world say?

ANALYSIS OF RETURN OF INTERRUPTIONS THROUGHOUT THE YEAR.

Designation of circle.	Number of interruptions.	Average duration of each in hours.	Total duration in days.
Bengal . . .	261	33	358
Punjaub . . .	260	28	303
Bombay . . .	151	18	113
East Coast . . .	220	30	275
Central India . . .	156	28	185
Madras . . .	54	25	56
Indore . . .	32	17	22
Scinde . . .	38	33	52
Dacca . . .	67	90	253
Pegu . . .	64	63	170
Totals . . .	1303	365	
Mean during the year } over whole of India . }	130	36½	

The returns for the south-east coast are omitted, as they were only available for three months.

But here is another frank acknowledgment on this point. After writing a final and magniloquent report on the efficiency of the department, which contains the following sentence—"There is a great future before the telegraph in India. By perseverance and determination it should be made the best in the world, inasmuch as it possesses a unity of organization unattainable elsewhere, with all the resources of the empire to promote its extension and improvement"—then comes the commentary appended in a foot note by the same writer, the head of the department :

"I received this day, 17th of May, by *post*, the official copy of a telegram addressed to myself by the Accountant-General at Calcutta, on the 1st instant. The message never reached me by telegraph. It contains a '*no demand*' certificate, without which I could not leave India in the steamer in which I have taken my passage. If the head of the telegraph department has to complain of such scandalous neglect by his own subordinates, the public must doubtless be still worse served."*

The third argument was :

3. That any comparison between the efficient working of the railway lines and the inefficiency of the Government lines was illusory.

It was urged that such a comparison was fallacious, because, while the railway lines passed alongside the railways, they were thereby protected and enjoyed every facility for rapid repairs, while, on the other hand, the Government lines passed through extensive swamps, wild mountain ranges crowned with primeval

* *Vide* Report for 1860.

forests, and hence are exposed to many calamities from which the railway lines are exempted. The Government lines are subject to the furious charges of armies of wild elephants, bisons, and buffaloes, occasionally accompanied by a terrible background of flaming jungles, and sweeping inundations, finally culminating in the awful catastrophe of an exterminated telegraph. And it was naïvely asked, how is a private company to combat such disasters, when they defy the mighty arm of an all-powerful Government?

At the time that this defence was set up, which was in October, 1861, it was replied to by simply comparing the working of a section of the East India railway line, from Calcutta to Burdwan, Rajmehal, Bhau-gulpore, &c., with a similar section of the Government line, which traversed the railway side by side with it along the entire route. It appeared from the Government returns that their line worked as follows: during the month in question:—In working order on the 3rd, 4th, 5th, 26th, 27th, 28th, 29th, 30th. Interrupted on the 1st, 2nd, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th; *i. e.*, out of thirty days in October, it was in working order for eight days, and interrupted for twenty-two, which, according to subsequent returns, appeared to be about the usual average of interruptions all over India. The railway telegraph, on the other hand, was in perfect working order the whole time, transmitting about five hundred messages daily.

CHAPTER VIII.

AN ERRATIC POLICY.

AMONG the questionable policies of the department was that of sending out young gentlemen from this country as signallers, and the experiment is even now about being repeated, when twenty-five more appointments are to be competed for. Ten years ago, when the importation of English signallers was first contemplated, it was pointed out that the experiment would be unsuccessful, because, although 120*l.* a year may seem a large sum to a young gentleman in England, to commence life upon on leaving school, he would soon find out his delusion on arriving in India. He would find that 120*l.* a year was scarcely sufficient to support him in respectability as a gentleman, surrounded as he would be on all sides by an artificial state of society. He would find that his position was one of considerable embarrassment and disappointment. He would, moreover, discover the real value placed on European labour in India, soon become dissatisfied, and leave the service. And this in reality has been the result. In the report for 1861-62, the director-general of telegraphs in India states, regarding the European staff—"twenty-five per cent. of the total number of Morse's assistants sent out from England, having already resigned, some to return home, but the greater portion to take other appointments in India, and there are others still in the department, who to my knowledge want a favourable opportunity for leaving it" (page 126). It was expected that

a revised scale of promotion would obviate this large desertion.

But what have those writing from India, and in India, to say on this point? The following is an extract from a letter which appeared in the *Irish Times* of 10th September last :

"I am sorry to see so many Dublin men have passed for the telegraph and public works departments in India. It is not a gentleman's profession at all, particularly the telegraph, in which the Government has already broken faith with a number of men, who were induced to come out here by plausible promises.

* * * * *

"I fear the poor Irishmen are leaping in the dark. People out here say, 'Oh ! none but Dublin or Queen's College men would take such appointments. The pay is not sufficient for gentlemen, and the pensions and other allowances are most meagre.'"

The *Calcutta Engineer's Journal*, of 1st June, 1865, in calling attention to this point, remarks :

"Now the fact of a man's having been two years in a school or college, recognised by the Secretary of State, as possessing an efficient class for instruction in chemistry and physics, is a guarantee that his position at home was something, at all events, approaching to that of a gentleman, and he naturally expects that when such an education is at all necessary to enter the department, that the work which he has to perform, and the social position which he occupies in this country, will be such as would give him an opportunity of making use of the knowledge he has acquired, and of meeting men whose education has been at all events equal to his own, and whose position is such as that education would warrant him to expect. It is scarcely necessary to state that he very soon finds out his mistake in ever having expected anything of the kind in the telegraph department. * * * * Nor does it seem advisable to tell a candidate, who has been a few months in the country, that it was a mistake ever having sent him out, for gentlemen are not required in the telegraph department. * * * * Considering that the number of men in the whole of India, whose salary amounts to five hundred a month or upwards, is, including the Director-General, only *eleven*,* their chance of receiving a

* Now increased to about twenty."

sufficient salary to enable them to lay by a little money, has scarcely even a microscopic existence."

But the official Report of last October says, "The annual advertisements published in the English papers, read very tempting to the youth of England ignorant of India and her ways," and it would seem as if the "youth of England" were beginning to detect something, for, at the competitive examination last year, only five candidates came forward for twenty-five appointments.

Moreover, there was another misconception in connexion with this measure, for it was an injustice to the Indian community. You offer low wages in India, and as a consequence get inefficient men, then launch out into polished invectives, a sweeping denunciation against the entire Indian community, and finally proceed to remedy the evil by importing labour from a distance at higher rates. Was it politic or just to raise the value of your labour market elsewhere, without first trying the effect of raising it on the spot? How, in the first instance, can it be expected that local respectability will join the department when the salary is low, and the prospects of promotion infinitesimal; or how, subsequently, can an Indian signaller on low wages enter into fair competition with a European signaller on higher pay, who monopolises all the avenues to advancement? Assimilate the labour market and its rewards to a settled standard open alike to all, and you will get your worth for your money. There is a hackneyed maxim, "a bad workman always complains of his tools," which was not inapplicable here.

Besides, every one knows the value and importance of example and early training, and here is an enticing picture of one of the nine Indian training schools as given in the latest very lucid official reports written

“at the top of a three-storied house,” whence the administration of the department is “blindly and theoretically” * carried on. “In fact, there is no school whatever, it is simply a training class supplemented by an adjacent empty bungalow, in which these youngsters may find shelter on the same terms as the pariah dogs, and are, in truth, not one whit more cared for.” Now, after such an admission from the Director-General himself, is there any use carrying on this discussion?

But there is yet another erroneous notion in connexion with this measure which deserves attention. The introduction of European signallers was intended to operate in improving the status of the department, and was to be the great regenerating medium to elevate it to a higher standard of efficiency. But the idea is illusory; where an entire system is fundamentally at fault, it cannot be improved in this meagre fashion. A few raw recruits added to a mutinous and disorganised regiment, will not raise it to a high state of discipline. It is but adding fuel to the flame. Take an analogous case. When Parliament transferred the government of India from the East India Company to the Crown, the financial condition of the country was enveloped in a hazy atmosphere. Such a precaution as an annual budget was unknown, the state of the Treasury balances was only attended to, and if there was a good balance at the banker's, all was supposed to be smooth and comfortable. And how did her Majesty's Government proceed to remedy the evil? Was it by sending out to the Accountant-General's office in Calcutta a few young clerks with embroidered uniforms, who had passed a satisfactory examination in arithmetic and elementary physics?

* *Sic* in the original Report.

CHAPTER IX.

FINANCIAL FAILURE, AND ARGUMENTS IN DEFENCE.

IN considering this question, it must be viewed in this light. It must be placed parallel with the policy pursued by the Government towards the Indian railway companies. It must be assumed that the Government, in place of erecting and maintaining the telegraph themselves, had said to a private telegraph company, "You must put up for us telegraphs wherever we require them, and whether it is profitable or not it matters little, we will guarantee you 5 per cent. interest on all the capital expended." Upon this assumption and upon this principle, which is admitted a correct one, the following results are developed. After a careful investigation of the official Parliamentary Return, No. 287, May 19, 1863, and No. 20, February 12, 1866, it will be found, that from the commencement in 1850-51, up to the latest financial returns in 1863-64, or during a period of thirteen years, the results are as follow :

1. That there has been expended upon	£.	s.	d.
works of construction, &c., in India	559,013	5	11
In England.....	585,021	12	9
Total of capital expended.....	1,144,034	18	8
2. That the maintenance and working			
charges have been	905,034	18	3½
The cash receipts from all sources have			
been	515,526	3	7½
Deficit	389,508	14	8½
3. That the interest upon the capital			
expended on construction, and funded			
losses on working charges, at 5 per cent.	383,473	0	0
Total losses on working and interest	772,981	14	8½
Total cost of telegraph up to 1863-64.....	1,917,015	13	4
Actual cost 1864-65 after deducting			
receipts	246,703	0	0
Total.....	2,263,718	13	4
4. If we carry the question still further,			
and add the budget estimates for 1865-66,			
we shall have for the subsequent year's			
estimated expenditure.....	385,000	0	0
Estimated revenue	130,350	0	0
Balance to be debited to capital.....	254,650	0	0
Current interest on capital and funded			
losses, as before	101,537	0	0
	356,187	0	0
Sum total of expenditure	2,619,905	13	4

From the foregoing, then, it follows, that up to 1864, the actual total expenditure on capital amounted to 1,144,034*l.* 18*s.* 8*d.*, and the loss on revenue and interest, 772,991*l.* 14*s.* 8½*d.*, making a sum total of 1,917,015*l.* 13*s.* 4*d.*

If the figures be carried still further and brought down to the present time, according to the budget estimates for 1865-66, it appears that during the financial year just closed, the telegraph department, exclusive of the Persian Gulf line, will have cost the Government 356,187*l.*, making the total expenditure

2,619,905*l.* 13*s.* 4*d.* Moreover, for the past five years, the telegraph has cost the Government as follows :

	<i>£.</i>
According to actual cost, including interest .	{ 1861-62 ... 230,424 1862-63 ... 342,881 1863-64 ... 268,799 1864-65 ... 246,703
According to budget estimate.....	1865-66 ... 356,187

Or on the average, upwards of 288,000*l.* per annum. The sum total that the department will have cost the Government from the commencement, including the current financial year 1866-67 (for which, according to the budget estimate, 318,882*l.* will have to be added) will be 2,938,787*l.*, or nearly three millions of public money.

These figures are rather staggering, and will doubtless create considerable surprise, but every item can be substantiated by the authorised returns and estimates.

Such, then, is the financial position of the vaunted telegraph of India. In all other parts of the world where land lines of telegraph in particular afford a solid and highly remunerative investment for capital, and, after setting aside a liberal allowance for a reserve fund, pay varying dividends from five up to ten, or even fifteen per cent. or higher, in India, where it is essentially a Government institution, it is worked at an enormous annual loss. Upwards of two and a half millions of public money have been expended to produce—what?—upwards of 288,000*l.* annually debited to the Indian exchequer for the past five years to repair, reconstruct, maintain, &c.—what? Popular clamour echoes the reply, and this is again echoed back from the blind infatuation of official archives. The inefficiency and bankruptcy of the Indian Telegraph Department stand out in melancholy relief alone, and insulated from the rest of the world. It is, in truth, the only insulation they can boast of.

In vindication of this great deficit, it has been replied that the Government of India do not expect a revenue from their telegraph, and this plea has been upheld in the face of an official announcement claiming for the Government the right of monopoly, and vindicating its right thereto, and in the face of an Act passed to protect the Government interests and prohibit competitors from interfering with the business. It was also upheld in the face of the prohibitory licenses granted to the railway companies, setting forth that they "shall not convey between any two places connected by a Government telegraph any messages except such as immediately and directly concern the working of the railway."* If no profit is expected, whence the necessity for these restrictive measures?

Besides, such a defence is incompatible with the statement made by his Excellency the Viceroy and Governor-General of India on the 10th April, 1865, when, in reply to a memorial from the Calcutta Chamber of Commerce regarding the new taxes on exports, the Right Honourable Sir John Lawrence said: "We must have income to meet all this inevitable expenditure, and where are we to get it? We cannot get it from taxes or imports; the people in England object to these, and the income-tax is objected to in India. Now, gentlemen, we have entered upon a career of government which forces us into a course of improvements, and improvements in the administration and increased expenditure mean the same thing. I look in vain for any present reduction in the expenses of governing India. Money must be had, and the Government are not in possession of any artesian well from which to secure an inexhaust-

* See Minute of the Most Noble the Governor-General of India, 20th May, 1858; also Electric Telegraph Act, No. VIII., of 1860.

ible supply, and where else it can be obtained, except from some small duty on exports, I cannot see." Surely if the Indian Government have such difficulty in finding money, and possess no fathomless artesian well to dip into occasionally, the discovery of a tiny rivulet like the telegraph, out of which upwards of a quarter of a million sterling can be picked up annually, ought not to be despised? *

There was also another plea set forth at one time in defence of this financial difficulty, which, from its amusing novelty, deserves notice. Indian political economists, when discussing the question, in a fit of abstract liberality, dispensed entirely with all interest on capital expended as quite derogatory to waste a thought upon, and, looking only at the excess of expenditure over revenue, exclaimed, "Well, after all, it is only the cost of a regiment of dragoons!"

* The annual budget just received from Calcutta, exhibits a deficit of 335,947*l.* for the past financial year. The cost of the Telegraph Department for the same year, will apparently amount to 356,187*l.*, including interest, or 20,000*l.* more than the deficit.

CHAPTER X.

AN EPISODE.

IN illustration of the peculiar ideas entertained on the telegraph in India, and the policy pursued by the authorities on this question, a description of some of the incidents which occurred on one of the Indian railways may be instructive.

Originally the telegraph on a great Indian Railway was under the superintendence of the Government authorities, who constructed and worked it for the railway company, much to their dissatisfaction. It worked so badly, was so constantly interrupted, that it was, in reality, utterly useless for any purposes whatever. So loud and reiterated at last became the complaints of its perfect inefficiency, that the position grew intolerable. At length matters were brought to a crisis by the telegraph causing an accident—the first accident on the line—in which one passenger had his arm broken, and another his nose cut off by the wire. The last operation was performed with surgical precision. This at once caused the railway company to take the telegraph into their own hands, and one of their engineers was re-

requested to assume charge of it in addition to his other duties, with the precaution to avoid dispossessing railway passengers of their natural ornaments.

The engineer, upon taking charge and carefully examining the state of affairs, found everything in such exquisite confusion, without even a semblance of organisation or administration of any kind, that six months' grace and a fair field were demanded, in order to carry out the necessary improvements, and instil some kind of discipline into the establishment. This was granted. Of course, like a new broom, an attempt was made to sweep everything very clean all at once; the instruments must be altered, the batteries changed, the line insulated from end to end, the office arrangements improved, rules and regulations introduced, some system in the working be adopted; in fact, a complete and thorough reform was to be substituted immediately. But this impetuosity was speedily checked by the Government calling the attention of the railway company to the stubborn reality of clause 1 of their licence, and they were requested to confine themselves within its provisions. The clause ran thus: "The system adopted on the lines of the Government electric telegraph, in respect of instruments, alphabet, and transmission of messages shall be adopted, and strictly followed by the railway company, and the officers of the said company shall conform to all instructions that they may receive on that behalf from the superintendent of electric telegraphs." The position now became paradoxical, because while one order commanded the adoption of such measures as were necessary to ameliorate existing evils, a second prohibited the doing of anything of the kind. Moreover, another virtual result was this. The Government, so to speak, by their act, placed an embargo upon

www.libtool.com.cn

telegraphic science in India; they officially prohibited its advancement, and limited all knowledge to their own standard, whatever that might be. Here, then, was the first difficulty, and the chances of redeeming the pledge given at six months' date, became very visionary. The first and natural impulse was to throw up the business entirely, and after debating internally as to the course to be pursued, and quite agreeing with the following maxim of a celebrated statesman that: "Reforms are dangerous experiments," it was resolved to desist from further attempts at rapid and violent action, and endeavour to see what could be effected by the more tedious but certain method of patience and gradual processes.

The position was this. The first evil to be remedied was the instruments. The instruments used by the Government consisted of the most primitive apparatus in three parts, viz., the needle and coil, the reverser, and the turn-plate. The peculiarity of their manipulation was such that you could not work *through* them—so as to pass on to a distant station. The consequence was, that if a message had to be sent between two termini, or say, a distance of only one hundred and twenty miles, it either had to be repeated from station to station, or each intermediate station had to call its neighbour to connect over until there was a through connexion completed, and then the message was sent direct. So that either the message had to be repeated several times over, or several messages had to be sent to the different stations to connect over, shutting out all intermediate stations from any intercommunication whatsoever in the interim. Of the two evils, therefore, the lesser was to repeat the messages from station to station. The result was, that all through messages

www.libtool.com.cn

were so delayed and mutilated, by incessant repetitions, that on their arrival at their destination they were, as a rule, useless, either from being too late, or unintelligible, frequently both together. Whenever it was tried to send messages by the connecting-over plan, which was sometimes done, it frequently occurred that an intermediate station, impatient to send a message, would break in upon the line, and so the through message was halved, quartered, and destroyed, until (as is frequently the case on the Government lines now) *it was lost on the road.*

By some manœuvring, and careful though tedious negotiation, permission was obtained from the Government to alter the reverser arrangement, and substitute a modification so as to enable the railway company to work through several stations together, and thus avoid many useless repetitions and consequent errors and delays. Here, then, was the first step gained. Then came the question of the battery. The batteries in use required renewal once a fortnight on the outside, and if not properly attended to, about once a week. This was a source of great annoyance to the staff as well as expensive in working, and as to suggest an alteration would be only another onslaught on the Government system, it required very delicate handling. Fortunately, economy became the order of the day, and taking advantage of the fashionable cry, a report was submitted, showing that a battery could be produced that would work for three to six months without renewal, and at a considerable reduction in the cost of the existing batteries, and on the ground of economy the alteration was allowed. Some further improvements with working regulations were also subsequently, and by degrees permitted, and so far a great feat had been ac-

complished. The banished English apparatus and English system of working had been quietly introduced on the line piecemeal, by Government sanction, and in spite of express orders to the contrary. Another paradox was thus produced counterbalancing the previous one. In fact, it was not until about two years after the negotiations first commenced, that the final formal sanction of the Government was obtained for the admission of the English system by that name.

At the same time that these improvements were being effected, permission was obtained from the Government to insulate the railway lines. This permission was not, however, obtained without some difficulty and even opposition; because the telegraph advisers of the Government were at direct issue with the railway company's advisers on this point. The Government advisers stated that insulation was unnecessary on long single lines in India, while the railway company maintained that, under all circumstances and conditions, it was in every case absolutely indispensable.

It must be here observed, that at the end of the six months already alluded to, the promised improvements were effected, and the note of hand redeemed. Where all had been complaint, confusion, and mismanagement, all was now order, harmony, and efficiency. Out of eleven thousand messages despatched monthly (since increased to about 100,000 per month), the complaints were so rare that they barely averaged one a month. Many of these telegrams contained about a hundred numerals. So marked and so sudden, indeed, was the change, and with such accuracy and rapidity were all messages sent, and the answers received from various stations on the line, that the railway authorities could not at first credit the evidence of their senses, and

declared that the messages never were sent at all, but that the signallers, on receiving a telegram to forward, were in the habit of concocting haphazard answers on the spur of the moment, and returning them per bearer immediately.

Thus far, then, the first clause of the license granted to the Indian Railway Companies, and which had special reference to the system to be adopted, was rendered null and void. Nevertheless, there was another very sombre clause disadvantageous to the public which required elucidation, and it was resolved that the same tactics which had accomplished so much, and so successfully hitherto, should be pursued.

This clause prohibited the railway companies from conveying between any two places connected by a Government telegraph any messages except such as directly and immediately concerned the working of the railway, but where there was no Government line the conveyance of any messages was permitted. As the clause contained an expression which might have led to a legal quibble, it was considered advisable to wait with patience until an opportunity arose for getting it modified. At last, in 1857, as an opening occurred, the attack was commenced, and a slight alteration was obtained. In the following year, a second opportunity offered, and the attack being repeated, a further modification was secured, which would admit of a very wide signification. Accordingly, it was very freely translated by the Indian railway companies, and worked very smoothly, until in May, 1861, the Director-General of the Government Telegraphs, not at all admiring the liberal and public spirit displayed by the railway authorities on the subject, burst suddenly upon them like a thunderbolt, and called on the Government to insti-

www.libtool.com.cn

tute an examination of the Railway Telegraph Office Books, an inquiry into the office management, the forfeiture of the sums collected, a reward to informers, and a punishment to defaulters. This brought the question to a decided and much-desired crisis, and a war upon paper now ensued which continued for some time, and after expending reams of ammunition the Government telegraph department, deserted by the Governor-General in Council, was compelled at last to yield to the steady persevering artillery of patience and gradual processes, until finally, in August, 1862, the whole of the railway telegraphs throughout India were declared free, and thrown open to the public without any restriction of any kind whatsoever.

CHAPTER XI.

ORACLES OF DESTINY.

THERE is no occasion for the perpetuation of the Indian telegraph in its present unsatisfactory condition, when all can be so easily reversed. India possesses a commercial basis capable of employing the telegraph to an extent at least proportionately equal in capacity and efficiency to the lines in civilised countries, and that telegraph need not stand in such a remarkably anomalous position. There is nothing whatever, neither theoretically nor practically, to prevent India from enjoying one of the best-worked and most remunerative systems of telegraphs in the world. On the contrary, there exist substantial and convincing proofs indicating with certainty a prosperous future, and the elements indispensable to guarantee success predominate to an unusual extent. India, in truth, demands what it has not got: it demands a comprehensive and reliable system of mercantile telegraphs for the general service of the community at large. What is there at present? Nothing, or its nearest equivalent—a semi-useless apology, which is almost worse than nothing. There are the limited and isolated railway telegraphs, erected

for the special economic purposes of the railway companies, which virtually go nowhere, and besides, being fully occupied with their own business, are compelled to exclude the public entirely, whenever accidents derange the traffic, or other emergencies arise; because, in such cases, the wires are monopolised by the urgent business of the various departments. There is a solitary Government wire erected purely for political and state purposes, which, besides being useless for half the year, has been closed to the public for days together when political emergencies have arisen; and it will be so closed again—closed, too, at the very period that the public most require its services. Moreover, at best, the public are only allowed to use this line upon favour and sufferance, because all Government messages have the preference in transmission. There does not exist a line devoted entirely to commercial purposes. Out of such a barren waste it is folly to imagine the wants of a great and wealthy empire like India can be adequately supplied. It is a physical impossibility. It would be as rational to expect a hundred waggons and carriages to accommodate the enormous traffic of the London and North-Western Railway, or the few wires erected for the special traffic requirements of the same company, or those constructed throughout this kingdom for the exclusive use of the Admiralty, to transact the immense telegraphic business of this country. In reality, the Indian community have no telegraph at all; and now, when their eyes are opened to this fact, they are, naturally enough, hungering after what they have not got. For ten long years they have patiently suffered—meeting, memorialising, reporting, and waiting—to see what the Government would do for them—and behold the bald result.

What, then, is the prospect? Scientifically and practically, the experience hitherto obtained clearly demonstrates that the telegraph can be worked assuredly as well in India as in any other parts of the world, and that there are no physical nor practical obstacles which cannot be easily overcome. Financially, there is a solid basis indicative of certain prosperity. India unfolds a splendid and almost virgin field for telegraphic operations, affording such brilliant prospects for the remunerative investment of capital as no other country in the world under civilised rule can present.

The subject demands to be viewed in an imperial and comprehensive light, commensurate with the great interests at stake, worthy of the occasion, and worthy of statesmen governing a vast, wealthy, and populous empire. It must not be narrowed down to the immediate present, but the exercise of a wise and moderate amount of foresight is imperative. This is imperative, not merely as a matter of state economy, but in order to meet the absolute requirements of the commercial and general public. To any one who has surveyed the subject, first, as a colossal whole, and then who has patiently and carefully investigated every minute detail in all its commercial as well as political ramifications, there can be but one conviction, and that is, that the Indian telegraph is destined to enjoy a marvellous prosperity, if only the right course be pursued. That the present extraordinary deficit will be succeeded by as remarkable a surplus, is a conviction based on careful scrutiny and sound deductions. But this great end will not be achieved by adopting trivial tentative measures, which only excite smiles from men of science, and periodical thunders of remonstrance from the mercantile world.

Why, then, with such a magnificent expanse for operation—with an unlimited supply of funds, and an uncontrolled and lavish expenditure—does India, in place of enjoying, as it ought to have done for years past, the finest, if not the most remunerative, system of telegraphs in the world, display such a deplorable picture? To what is to be attributed this general collapse? Notwithstanding that the Court of Directors of the late Honourable the East India Company, in one of their earliest despatches, expressed the profoundest anxiety lest, in so great and momentous a question, any false step should be made at the outset, whereby all after consequences should be effected for good or for evil, that unfortunate step was taken. The cause of failure is summed up in a sentence. It arises principally from mismanagement, the inherent result of inexperience, and an improper comprehension and elaboration of the enterprise. From the genesis of the undertaking up to the present time, this feature has been the paramount characteristic. Hence it is quite intelligible how, by making a false start, by abandoning the main elements most essential to success, and then perpetuating the same policy, there should be, as there only could be, one result. In lieu of commencing upon the vantage-ground of the latest discoveries and advanced experience of Western science, which had made great and rapid strides at the time, the Indian Telegraph Department, throwing these scornfully aside, started on crude hypotheses, and consequently has had to learn everything within itself, pass through its own novitiate, purchase its own experience at a heavy cost, discover its own mistakes from time to time, and re-traverse the various phases of experiment discarded and left behind in Europe many years ago.

It would be well here to ponder over the famous illustration of the watch, for the analogy can be applied with equal significance. Of what use are the separate pieces of the watch without the master mind to put them together and make them work harmoniously, and perform their required duties? Or, better, there is a well-known apophthegm pronounced by a celebrated statesman of Queen Elizabeth's reign: "A man must first govern himself ere he be fit to govern a family, and his family ere he be fit to bear the government in the commonwealth." The same principle applies with equal force to questions of practical and applied science. Experience combined with skill specially pre-exercised can alone insure successful issues on a wide administration, and this is the more necessary where misrule and disorganisation have hitherto run rampant.

If, then, there be any truth in the incontrovertible testimonies of practical and economical philosophy, where is the wisdom of persisting in a track, which, however it may accord with a clinging fondness to long-established partialities, culminates only in inefficiency, financial disaster, and popular opprobrium?

CHAPTER XII.

EFFORTS AT EMANCIPATION.

THE necessity for the formation of a private telegraph company for India became self-evident soon after the opening of the Government lines to the public in 1855. The little regard paid to the interest of the public, the constant occupation of the wires on official business, and their frequent and prolonged interruptions, created universal dissatisfaction throughout the country. The advisability of forming a private company was mooted, but the great difficulty in the way was the Act passed by the Government in 1854, conferring upon themselves the monopoly of all the telegraphs in India. There was a clause, however, in the Act, under which a company could be formed by obtaining a license from the Government; but the procuring of such a license was considered hopeless at the time, for the Government were determined to maintain the monopoly in its strictest integrity. They would not even allow the railway companies in which the Government had a pecuniary interest to transmit messages, except on their own immediate business. The Indian public, therefore, were powerless to assist themselves, and had only to growl and suffer.

In 1857 the mutinies broke out, and the transfer in due course of the Government of India from the late Honourable the East India Company to the Crown opened out better prospects for the formation of a private commercial telegraph company, and the question was again discussed. It was generally believed that the Crown would not endorse the exclusive policy that had hitherto been pursued towards a scientific invention of universal public utility, especially as such a monopolising spirit was directly opposed to the liberal and enlightened views of the British Government.

Accordingly in May, 1859, initial steps were taken in England for forming a private company, and it was determined that, with this object in view, measures should be pressed forward simultaneously in England and India. The company was to be called "The Oriental Telegraph Company," and the following clauses from the draft prospectus framed at the time, and dated 19th July, 1859, will illustrate the position, and most of the statements then advanced will apply with equal force now :

"It is a notorious fact that, although the Government of India have established lines of telegraph throughout that vast empire, these lines are frequently overtaken with Government business, and have been at times closed to the public by advertisements in the local newspapers. The wants of the public are, therefore, but ill provided for; in fact, the public have been at times either entirely excluded, or their messages taken for transmission subject to the convenience of the Government service or the caprices of a telegraph clerk.

"It is an equally notorious fact that the Government lines are subject to frequent and sometimes prolonged interruptions, that delays and errors are of constant occurrence, and that therefore the lines are not to be

depended upon for the safe and rapid transmission of telegraphic communication. Hence a great feeling of distrust has arisen in the minds of the commercial and mercantile community of India, and the telegraph is very far from being employed to that extent to which it otherwise would be if perfect confidence could be reposed on the security and celerity of the system, and the requirements and interests of the public were more carefully studied. Further, the Government lines are altogether inadequate to meet the requirements of the community. They are only capable of conveying from 500 to 800 words per hour under the most favourable circumstances, and, consequently, to work off a press of messages, the telegraph offices are all closed to the public after six P.M.

“Such, then, being the disadvantages and inconveniences under which the Indian public are now labouring, it is easy to prognosticate the unsatisfactory, nay, deplorable condition in which they will be placed when the overland and submarine lines now in course of construction are completed, when an immense influx of business is thrown upon the already overtaxed Government lines, when, in fact, Government House in Calcutta is virtually ruled from Downing-street in London.”

The following extracts from the private letter of a gentleman well conversant with the subject, written at the same time, will further elucidate the question, and illustrate how completely the present position of affairs was anticipated, nay, rather prophesied, nearly seven years ago :

“It appears to me that there are two courses open for the formation of the company. First, to endeavour to conciliate the Government by showing the necessity for a company to meet the wants of the public, the

Government lines being so fully employed on official business, and to obtain from them a license to erect telegraphs anywhere in India ; and, if this failed, then to have an open parliamentary inquiry.

“ In supporting the case, it might be argued, in addition to the arguments set forth in the prospectus, the impropriety of the Government monopolising an invention of general public utility, the derogatory position in which a Government places itself by turning speculator, the great advantages and the rapid strides made in the telegraphs in England of late years from having wholesome competition, and the infinite advantage it would have been to the late Government if, during the mutinies, they had possessed duplicate lines of communication passing through different districts.

* * * * *

“ People in England imagine that the Government telegraph lines in India are in excellent condition, and the Red Sea and India Telegraph Company think that they have only to join Alexandria with Kurrachee, and their work is done. But they will one day awake from their dream ; they will one day find the hollowness of the Indian telegraph system, notwithstanding all * * * boastings ; and when they find that their messages from London to Bombay, Calcutta, and Madras, and *vice versa*, are delayed on the Indian lines to suit the convenience of an already overtaxed and inefficient telegraph, they will set to and in self-defence raise additional capital, or form a new company, for erecting commercial telegraph lines throughout India, just as they now find it advisable to erect overland lines from Alexandria to Suez, so as to be entirely independent of the lines of the Egyptian Government.” *

* This letter was dated 19th July, 1859.

These proceedings were unfortunately and suddenly brought to an abrupt termination by the unexpected death of the gentleman who had undertaken to work the matter in England, a gentleman eminent for his high scientific attainments and practical knowledge of telegraphy. For the time being all progress was arrested, and the failure of the Red Sea Telegraph further complicated the difficulties which beset the undertaking. Nevertheless, the necessity for a private company was so evident, and convinced that it was only a question of time, no opportunity for pressing or agitating the matter was lost sight of; and meanwhile it was considered advisable to prepare the way, to a certain extent, by gradually obtaining the removal of the restrictions placed on the railway telegraphs throughout India in the manner already recorded in a previous chapter. This point was steadily persevered in, because it was believed that the moment the restrictive licenses granted to the Indian railways were withdrawn, an admirable opening would be at once presented for the establishment of a private telegraph company in co-operation with the existing Indian railway telegraphs.

Matters progressed steadily and favourably until the loud outcry raised against the shortcomings of the Government lines in 1861 caused the interference of the Governor-General; and on the 15th January, 1862, the Government of India, in a letter addressed to the Bengal Chamber of Commerce, invited the formation of a private telegraph company for erecting a commercial line of telegraph between Calcutta and Bombay; and in the same letter stated that, subject to the fixed condition of the Government enjoying the priority in all messages on payment of the usual rates, "there would be no objection made by the Government to the

construction of private lines of telegraph in any direction from one part of India to another."

In pursuance of this intimation, and in conjunction with two of the Directors of the East Indian Railway Company, a letter was addressed by the author to the Indian Government on the 10th June, 1862, offering to form a private company in London upon certain specified terms, which at the time were considered necessary to induce capitalists in England to embark in the undertaking. In the event of these terms not being consented to, an alternative course was proposed, which would enable the East Indian Railway and Great Indian Peninsula Railway Companies to supply conjointly the requirements between Calcutta and Bombay.

The Secretary to the Government of India in the Home Department replied to this application, in a letter, No. 4004, dated Fort William, 6th August, 1862, and declared the inability of the Government of India to accede to the conditions submitted; at the same time the Governor-General in Council most liberally consented to the alternative plan suggested, viz., the removing the restriction placed upon the railway companies' telegraphs as to the conveyance of private messages, and this concession was at the time publicly notified in India.

Upon this reply and notification, one of the above-named Directors withdrew from the undertaking, and a new combination being formed, certain negotiations were entered into between the proposed telegraph company and the Boards of the Indian railway companies in London. These negotiations, after being referred to India, and freely discussed by the local authorities, were ultimately negatived by the Right Honourable the Secretary of State, on the 6th Sep-

tember, 1864, in the following terms: "After attentively considering the matter in Council, I have come to the conclusion that it is not desirable that the proposed transfer should be made, and have informed the railway companies accordingly."

Matters then remained in abeyance for four months; and with a view of reviving the question, on the 6th of February, 1865, a further communication on the subject was made to the Right Honourable the Secretary of State for India, with the view of ascertaining if the Government would be disposed to allow a private telegraph company to erect commercial wires upon the Government as well as railway supports where available, and a certain equitable basis of negotiation with such proposed private telegraph company was submitted.

On the 25th of May, 1865, the Right Honourable the Secretary of State replied to the above letter of the 6th of February, stating that he was "not at present prepared to give any opinion on the subject," viz., of suspending commercial wires on the Government or railway companies' supports.

Thus, so far as the carrying on of negotiations in this country was concerned, everything was apparently brought to a dead lock. It was therefore considered advisable to apply to India, and having ascertained the views of the mercantile community and capitalists in London, a carefully considered plan was submitted to the Government in India, with the view of urging on the question, and bringing it to some definite result. The new and improved scheme now propounded was of a most extensive and elaborate nature, embracing almost every station in the three Presidencies of India,

which, so far as was at the time known, the Government or the public could desire. In submitting these carefully revised and more comprehensive proposals for the consideration of the Indian Government, it was stated that the main object was to ascertain conclusively if the Government will allow a private company to erect wires upon the Government standards, and in that case if they would mention either in general or particular terms the conditions as to money payment, maintenance, repairs, working, &c., in fact, the basis upon which the Government would be prepared to treat with a substantial and duly organised company. At the same time an application was also submitted for a license for the proposed company, under Act No. VIII. of 1860, "to construct telegraphs throughout any part of India, either upon the Government or railway posts, or altogether independently of them, or otherwise as circumstances may direct." In reply to this application, the Government stated, on the 22nd of December last, that they "cannot consent to the proposed arrangement" of allowing a private company to erect wires on the Government supports, nor will they grant any concession except upon a specific proposal.

It is difficult to view this reply in any other light than that of evading the real point at issue, and while avowing a liberal policy, yet tacitly maintaining the monopoly by obstructing progress. Because the Government of India had before them a proposition with a clear and well-defined plan, showing the various lines proposed to be constructed in the first instance. Nor were they asked for any commitment beyond what was absolutely necessary as evidence that they were really in earnest in their declarations. The authorities are

well aware that there are other legal forms to be gone through, when it would have been time enough to have entered into specific details. ●

Now just recal the course of these transactions. On the 15th of January, 1862, the Government of India invite the public to come forward and establish commercial lines for themselves, and state that, subject to one condition, "there would be no objection made by the Government to the construction of private lines of telegraph in any direction, from one part of India to another;" and at the present time, in April, 1866, or more than four years afterwards, the negotiations have not advanced a step beyond the bare invitation. Certainly it is time that Parliament has intervened in the interests of the common weal.

A P P E N D I X.

THE GREAT OPIUM FRAUDS.

PERHAPS the first instance on record of wholesale frauds being perpetrated upon the telegraph wires occurred at Bombay, and henceforward the Indian Telegraph will enjoy the unenviable notoriety of having originated this rather novel procedure. Although the frauds to which attention is about to be drawn occurred about five years ago, it is notorious that even at the present moment the system is perpetuated, because somehow or other the native merchants in the bazaars throughout India manage to obtain information of mercantile news long before the recipients of the telegrams are informed themselves. In the evidence before the Parliamentary Commission now sitting, one of the largest Indian houses in London exhibited a long list of very recent telegrams, sent from London to Calcutta, in all of which the most important parts were omitted, and the quotations deliberately altered to suit the Calcutta markets. The frauds now alluded to refer to the falsification of the opium advices, which inflicted a loss of 100,000*l.* on those who acted on the misquotations. The first falsification took place on the arrival of the steamer *Pekin* at Galle from China on the 30th of December, 1861. The following list will exhibit the telegrams as sent from Galle, and the alterations as delivered to the recipients at Bombay :

	Originals.	Dolls.	Falsified.	Dolla.
Public News.	Malwa	675	Malwa	645
"	Patna	895 to 900	Patna	845
"	Benares	895	Benares, omitted.	
Private News, No. 1.	Benares	800	Benares	750
"	Malwa	580	Malwa	550
"	No. 2. Benares	800	Benares	850
"	Market firm		Market dull.	
"	Malwa	580	Malwa, omitted.	
"	No. 3. Benares	900	Benares	850
"	Malwa	680	Malwa	650
"	Market, firm.		Market, dull.	
"	No. 4. Malwa	675	Malwa	645
"	Patna	900	Patna	850
"	No. 5. Hong-Kong.		Hong-Kong.	
"	15th December	996	15th December	856
"	No. 6. Patna 250 more, double	125	Patna 200 more, double	100
"	No. 7. Malwa	525	Malwa	495
"	Patna	640	Patna	590
"	No. 8. Malwa	150	Malwa	120
"	Patna	275	Patna	205
"	No. 9. Malwa	675	Malwa	645
"	Benares	900	Benares	840

The intention of the instigators of this fraud was to lower the value of the drug in the Bombay market, and it will be seen that in almost every instance the prices were lowered 30 dollars per chest for Malwa, and 50 dollars for Benares and Patna, and where the market was stated to be "firm," it was changed to "dull."

Again, on the 15th of January, 1861, another falsification of the messages occurred at Bombay on the arrival of the steamer *Ottawa* at Galle from China, as follows:

	Originals.	Dolls.	Falsified.	Dolla.
Public News.	New Patna	900 dollars.	New Patna	880
"	New Benares	900	New Benares	880
"	Malwa	665	Malwa	652
"	Patna	680 taels	Patna	670 taels
"	Malwa	580	Malwa	514

	Originals.	Dolls.	Falsified.	Dolla.
Private News, No. 1.	Patna . . .	901	Patna . . .	881
"	Benares . . .	901	Benares . . .	881
"	Malwa . . .	65	Malwa . . .	52
"	Patna . . .	75	Patna . . .	70
"	Malwa . . .	10	Malwa . . .	6
"	No. 2. Patna . . .	277	Patna . . .	257
"	Malwa . . .	150	Malwa . . .	137
"	Bills . . .	222	Bills . . .	225
"	No. 3. Patna . . .	277	Patna . . .	20 lower.
"	Malwa . . .	5 lower.	Malwa . . .	15 "
"	No. 4. " . . .	"	Patna . . .	880 "
"	" . . .	"	Malwa . . .	662 "
"	" . . .	"	Market, dull.	

After some little delay the perpetrators of these frauds were discovered, and among the chief causes of their detection were pieces of paper with telegrams written on them, found where they had been operating. On one of these pieces was written: "When the price of Patna is above 890 we should lower 50 rupees, and take Maneek Chand's name. Should the price be less than 890 we should higher 50, and take Tarra Chand's name." It turned out that the delinquents were two signallers who had been dismissed from the Government service, and who had been bribed to commit the frauds by native merchants in Bombay. The mode in which the purpose was effected was by cutting the wire at Khandalla and Poonah, not far from Bombay, and there intercepting the telegrams and passing them on with altered quotations. One of the culprits, after being taken into custody, confessed that he had been bribed, and pointed out a native merchant who had bribed him, but there was not sufficient evidence to justify taking proceedings against the accused. On the trial of the prisoners at Bombay, a native witness who assisted them, thus described the operation:

"After having pitched a tent and prepared a battery, the second prisoner threw a string over the wire, pulled it down, and partly cut it with a file. I was then ordered to cut it through. At the time I was cutting the wire, the first prisoner was fixing a machine—the first prisoner saw what I was doing. I assisted the second prisoner in putting down the wire. The second prisoner held the wire while I was cutting it. After the wire was cut, both prisoners

fixed another wire to the broken ends of the wire. They took the new wire from the box. The other end of the wire was attached to a machine in the tent. The ends of both wires were attached to the machine in the tent. It was like a machine I saw at the Poona Railway station, used by the telegraphic people. The second prisoner wrote something on a piece of paper, and the first was shaking the machine. There was a thing in the instrument which pointed to numbers. The prisoners were working at the machine, and writing all day and night. The next day they did the same business."

The two prisoners were found guilty and sentenced to imprisonment with hard labour for eighteen months, while the real instigators, the native merchants, escaped altogether. This escape rather encouraged the merchants to continue their malpractices, for soon afterwards two Marwarree merchants were taken up for offering bribes to the Telegraph officials at Sattara, found guilty, and sentenced to the altogether inadequate punishment of a fine of 20% with six months' imprisonment with hard labour.

But this is not the only way in which the contents of important private mercantile messages become known in the bazaars long before the real addressees themselves get the telegrams. One gentleman in the Bombay office used to be troubled with extraordinary deafness whenever telegrams of importance were being received, and the signallers were obliged to shout them out for his information, *and* the information of others conveniently placed to hear them. Again, the system adopted of sending the telegrams by sound considerably simplified the mode of procedure. The reading off of the signals by the clicking of the armature against the electro-magnet was a great boon to the bazaar harpies, and a very profitable investment for the signallers. The plan usually adopted is this. The signallers who are off duty being a part of the establishment have free access to the premises, though not to the signalling room, at all hours. In some offices the clicking of the instrument is sufficiently loud to be heard in the adjoining room or verandah, and the signallers off duty employ their holiday-time very profitably in this ante-room or in the verandah, taking down the messages simultaneously with the signaller receiving them. The boy then saunters away from the office with the telegram in his pocket, and hurries

off to his merchant friend, who thus gets the telegram a couple of hours before the real addressee knows of its existence. And this is the real solution of the mystery how mercantile messages become known to the native merchants, and are acted upon hours before the real addressee, the English merchant, knows anything about them.

COBWEBS.

It was intended to have gone fully into this question, but this discussion has proceeded to such an unexpected length that the matter will only be mentioned to show the extent to which official peculiarities are sometimes carried in India. On one occasion, one of the Indian Railway Companies required about sixty miles of telegraph to be erected very rapidly, and as the Government had a line running along the route, permission was obtained to suspend the wire on the Government posts temporarily, and until the Railway Company could have their own posts erected. No sooner was the Railway wire up than the head of the Government Telegraph Department at once obtained from the Government of India peremptory orders to close up these sixty miles of Railway line on the plea that it was objectionable to work two wires on the same posts in India, because cobwebs forming on the wires, and connecting them together, would produce contact and cause an interruption, and the line was accordingly closed. To clinch the argument with the Government, their superintendent instanced a case alleged to have occurred in America when an interruption was produced from such a cause.

Without going into any lengthened discussion on this point to prove its absurdity, it need only be stated as illustrative of the blindness with which the authorities in India will sometimes commit themselves, that at the very time the Government allowed the Railway Telegraph to be closed up upon such an idle pretext, the Government posts in Calcutta and its vicinity had four wires suspended upon them in one place, three wires in another, and two wires in a third, for a distance of one hundred and twenty miles or more into the country. The Railway

Company had also themselves been working two wires on the same supports for a long time without any interruption whatsoever from cobwebs.

But the sequel to this story is admirable. Not long after the above occurrence a storm swept over and destroyed a great portion of the Government line; so complete, in fact, was the destruction, that the Government officers solicited, and at once obtained, permission to suspend their wire on the Railway Company's supports until their line could be reconstructed, and the wire remained so suspended for some time, without of course the slightest inconvenience.

THE END.

LONDON :

PRINTED BY C. WHITING, BRAUFORT HOUSE, STRAND.

www.libtool.com.cn

www.libtool.com.cn

LIST OF BOOKS

PUBLISHED AND SOLD BY

E. & F. N. SPON,

16, BUCKLERSBURY, LONDON.

Ancient Alphabets.

The Book of Ornamental Alphabets, Ancient and Mediæval, from the Eighth Century, with Numerals, including Gothic, Church Text, (large and small), German, Italian, Arabesque, Initials for Illumination, &c., &c., for the use of Architectural and Engineering Draughtsmen, Illuminators, Masons, Decorative Painters, Lithographers, Engravers, Carvers, &c., &c., drawn and engraved by F. Delamotte, fifth edition, with additions, royal 8vo, oblong, cloth, 4s.

Architect & Surveyors' Handbook.

A Handbook for Architectural Surveyors and others engaged in building, by J. T. Hurst, C.E., containing formulæ useful in designing Builders' work, tables of the weights of the materials used in Building, memoranda connected with builders' work, mensuration, the practice of builders, measurement, constants of labour, valuation of property, summary of the practice in dilapidations, and a scale of professional charges for Architectural surveyors, &c., &c., royal 32mo., roan, 5s.

Brewing.

Instructions for making Ale or Beer in all temperatures, especially adapted for Tropical Climates, by John Beadel, on a sheet, 6d.

5000/12/1/68,

LIST OF BOOKS PUBLISHED BY

Channel Railway (The).

Connecting England and France, by James Chalmers, *plates*, royal 8vo, cloth, 3s. 6d.

Cottage Residences.

Downing's (A. J.) Cottage Residences, or a series of designs for Rural Cottages and Cottage Villas, *illustrated by numerous engravings*, fourth edition, 8vo, cloth, 12s.

Cottages.

Vaux's Cottages and Villas, new edition, revised and enlarged, *numerous engravings*, royal 8vo, cloth, 12s. 6d.

Cottages.

Designs for Schools, Cottages, and Parsonage Houses for Rural Districts, by H. Weaver, folio, half-bound, 7s. 6d.

Chocolate and Cocoa.

Cocoa; its Growth and Culture, Manufacture, and Modes of Preparation for the Table, *Illustrated with Engravings*, accompanied by easy methods of analysis, whereby its purity may be ascertained, by Charles Hewett, post 8vo, price 1s.

Coffee and Chicory.

Coffee and Chicory; their Culture, Chemical Composition, Preparation for Market, and Consumption, with simple tests for detecting adulteration, and practical hints for the producer and consumer, by P. L. Simmonds, F.S.S., Author of "The Commercial Products of the Vegetable Kingdom," "Dictionary of Products," &c, &c., post 8vo, sewed, 1s.

Cotton Cultivation.

Cotton Cultivation in its various details, the Barrage of Great Rivers, and Instructions for Irrigating, Embanking, Draining and Tilling Land in Tropical and other Countries possessing high thermometric temperatures, especially adapted to the improvements of the cultural soils of India, by Joseph Gibbs, Member Institute Civil Engineers, *with 5 plates*, crown 8vo, cloth, 7s. 6d.

E. & F. N. Spon, 16, BUCKLESTREET, LONDON.

Cotton Supply.

Considerations relative to Cotton Supply as it was, as it is, and as it might be, by Joseph Gibbs, Member Institute Civil Engineers, 8vo, sewed, 1s.

Earthwork Tables.

A general Sheet Table, for facilitating the Calculation of Earthworks for Railways, Canals, &c. by F. Bashforth, M.A., on a large sheet, 6d.

Earthwork Tables.

A general Table for facilitating the Calculation of Earthworks for Railways, Canals, &c., with a Table of Proportional Parts, by Francis Bashforth, M.A., Fellow of St. John's College, Cambridge, in 8vo, cloth, with mahogany slide, 4s.

"This little volume should become the handbook of every person whose duties require even occasional calculations of this nature; were it only that it is more extensively applicable than any other in existence, we could cordially recommend it to our readers, but when they learn that the use of it involves only half the labour of all other Tables constituted for the same purpose, we offer the strongest of all recommendations, that founded on the value of time."—*Mechanics' Magazine.*

Earthwork Tables.

Tables for facilitating the calculation of Earthwork in the Cuttings and Embankments of Railways, Canals, &c., second edition, corrected and considerably enlarged, by Sir John Macneill, 8vo, cloth, 31s. 6d.

Earthwork Tables.

Tables for facilitating the calculation of Earthwork in the construction of Railways, Roads, Canals, Dams, &c., by David Cunningham, C.E., royal 8vo, cloth, 10s. 6d.

Electricity.

Memorials, Scientific, and Literary, of Andrew Crosse, the Electrician, 12mo, cloth, 3s. 6d.

Electricity.

A Treatise on the Principles of Electrical Accumulation and Conduction, by F. C. Webb, Associate Institute Civil Engineers, part I., crown 8vo, cloth, 3s. 6d.

LIST OF BOOKS PUBLISHED BY

Electricity.

A short History of the Electric Clocks, with explanations of their principles and mechanism, and instructions for their management and regulation, by Alexander Bain, cuts, 8vo, sewed, 6d.

Electro-Metallurgy.

Contributions towards a History of Electro-Metallurgy, establishing the Origin of the Art, by Henry Dircks, crown 8vo, cloth, 4s.

Engineers' Pocket-Book.

A Pocket-Book of useful Formulæ and Memoranda for Civil and Mechanical Engineers, by Guildford L. Molesworth, Member Institute Civil Engineers, Chief Resident Engineer Ceylon Railway, eighth edition, revised and improved, 32mo, roan, 4s. 6d.

"Mr. Molesworth has done the profession a considerable and lasting benefit by publishing his very excellent Pocket-Book of Engineering Formulæ. What strikes us first, is, the very convenient size and form of the book adopted by the author; and next, in glancing over its contents, we are pleased to find many really useful things not found elsewhere in any Engineering Pocket-Book. Mr. Molesworth's treatment of Hydraulics and Hydro-Dynamics, and Motive Power generally, is excellent. To the latter branch of his subject, Mr. Molesworth has evidently devoted considerable attention, and his collection of formulæ will be found most useful. But to stop to detail everything that is good and useful in this book, would be nearly equal to reprinting a list of its contents."—*Artisan*, April, 1863.

Engineers' Price Book.

Appleby's Illustrated Handbook and Prices Current of Machinery and Iron Work, with various useful Tables of Reference, compiled for the use of Engineers, Contractors, Builders, British and Foreign Merchants, &c., 8vo, cloth, 2s. 6d.

Fish Cookery.

A practical Treatise on the Choice and Cookery of Fish, second edition, 12mo, cloth, 2s. 6d.

Gas.

The Gas Works of London, by Zerah Colburn, C.E. Member Institute Civil Engineers, &c. Contents: Sketch of the Gas Works of London, Process of Manufacture, Quantity produced, and Cost, Profits, &c. Crown 8vo, boards, 1s. 6d.

R. & F. N. SPON, 16, BUCKLESHURRY, LONDON.

Gasometry.

Comprising the leading physical and chemical properties of Gases, by R. Bunsen, translated by Roscoe, 8vo, cloth 3s. 6d.

Gold-Bearing Strata.

On the Gold-bearing Strata of Merionethshire, by T. A. Readwin, F.G.S., 8vo, sewed, 6d.

Heat.

An enquiry into the Nature of Heat, and into its Mode of Action in the Phenomena of Combustion, Vaporisation, &c. by Zerah Colburn, 8vo, boards, 2s.

Hydraulics.

Tredgold's Tracts on Hydraulics, containing Smeaton's experimental Papers on the Power of Water and Wind to turn Mills, &c., &c., Venturi's Experiments on the Motion of Fluids, and Dr. Young's Summary of Practical Hydraulics, *plates*, royal 8vo, boards, reduced to 6s.

Illumination.

A Primer of the Art of Illumination, for the use of beginners, with a rudimentary treatise on the art, practical directions for its exercise, and examples, taken from Illuminated MSS. in gold and colours, by F. Delamotte. small 4to, cloth gilt, 9s.

"Modestly called a Primer, this little book has a good title to be esteemed a manual and guide-book in the study and practice of the different styles of ornamental lettering used by the artistic transcribers of past centuries. . . . An amateur may, with this silent preceptor, learn the whole art and mystery of illumination."—*Spectator*.

Illumination Initials.

Mediæval Alphabets and Initials for Illuminators, by F. G. Delamotte, with an Introduction by J. Willis Brooks, printed in gold and colours, small 4to, cloth gilt, 6s.

Iron Bridges.

A complete Treatise on Cast and Wrought Iron Bridge Construction, including Iron Foundations, in three parts, theoretical, practical, and descriptive, by William Humber, Associate Institute Civil

LIST OF BOOKS PUBLISHED BY

Engineers, and Member of the Institution of Mechanical Engineers, 2 vols, imperial 4to, containing 80 *double plates*, and 200 pages of text; an entirely new work, £6 16s. 6d.

Iron Bridges.

Diagrams to facilitate the Calculation of Iron Bridges, by Francis Campin, C.E. folded in 4to, wrapper, 2s. 6d.

Iron Bridges.

A practical Treatise on Cast and Wrought Iron Bridges and Girders as applied to Railway Structures and to Buildings generally, with numerous examples drawn to a large scale, selected from the Public Works of the most eminent Engineers, with 58 *full page plates*, by William Humber, Associate Institute Civil Engineers, and Member of the Institution of Mechanical Engineers, imperial 4to, half-bound in morocco, £1 16s.

"Mr. Humber's admirable work on Iron Bridges."—*The Times*.

Iron Manufacture.

The Iron Manufacture of Great Britain, Theoretically and Practically considered; including Descriptive Details of the Ores, Fuels, and Fluxes employed; the Preliminary Operation of Calcination; the Blast, Refining, and Puddling Furnaces; Engines and Machinery; and the various Processes in Union, &c., by William Truran, C.E., formerly Engineer at the Dowlais Iron Works, under the late Sir John Guest, Bart., subsequently at the Hirwain and Forest Works, under Mr. Crawshaw, third edition (reprinted from the second) by J. Arthur Phillips, Author of a "Manual of Metallurgy," "Records of Mining," &c., and W. H. Dorman, C.E., royal 4to, half morocco, *illustrated by 84 plates of furnaces and machinery*, £2 2s.

"Mr. Truran's work is really the only one deserving the name of a treatise upon and text-book of the Iron Manufacture of the Kingdom. It gives a most comprehensive and minute exposition of present practice, if the term may be applied to Iron Manufacture as distinguished from strictly professional subjects. The author does not go out of his way to theorise upon how Iron should or may be made, but he describes how it is made in all the Iron Districts of the Kingdom."—*Engineer*, December 26, 1862.

E. & F. N. SPON, 16, BUCKLESBURY, LONDON.

"It has seldom fallen to our lot to introduce to the notice of the scientific public a more valuable work than this. It is evidently the result of long, careful, and practical observation, and it forms at once a glorious monument to the memory of its author, and an excellent guide to those who are directly or indirectly interested in the great subject of which it treats."—*Mechanics' Magazine*, Sept. 26, 1862.

Jonathan Hulls.

A description and draught of a now invented Machine for carrying Vessels or Ships out of or into any Harbour, Port, or River, against Wind and Tide, or in a Calm, by Jonathan Hulls, 1737, reprint in fac-simile, 12mo, half-morocco, reduced to 2s., sewed, 1s.

Levelling.

Principles and Practice of Levelling, by E. Jones, cuts, 12mo, cloth, 1s 6d.

Locks and Safes.

A Treatise on Fire and Thief-proof Depositories, and Locks and Keys, by George Price, in one large vol. (916 pages), with numerous wood engravings, 8vo, cloth gilt, 5s.

Mechanical Drawing.

An elementary Treatise on Orthographic Projection, being a new method of teaching the Science of Mechanical and Engineering Drawing, intended for the instruction of Engineers, Architects, Builders, Smiths, Masons, and Bricklayers, and for the use of Schools, with numerous illustrations on wood and steel, by William Binns, Associate Institute Civil Engineers, late Master of the Mechanical Drawing Class at the Department of Science and Art, and at the School of Mines, formerly Professor of Applied Mechanics at the College for Civil Engineers, &c., fourth edition, 8vo, cloth, 9s. Mr. Binns' System of Mechanical Drawing is in successful operation in all the Art Schools of the United Kingdom.

"Mr. Binns has treated his subject in a practical and masterly manner, avoiding theoretical disquisitions on the art, and giving direct and applicable examples, advancing progressively from the correct orthographic projection of the most simple to the most

LIST OF BOOKS PUBLISHED BY

complex forms, thus clearing away the mist from the mind of the student, and leading him gradually to a correct and thorough appreciation of what he has undertaken, and to that which it is his desire to attain."—*The Artizan*.

Mechanics for Practical Men.

Treatise on the Composition and Resolution of Forces, the Centre of Gravity, and the Mechanical Powers, by Alex. Jamieson, L.L.D., *plates*, 8vo, cloth, 6s.

Memoirs of Scientific Men.

Memoirs of the Distinguished Men of Science of Great Britain, living A.D. 1807-8, by W. Walker, Jun., with an introduction by Robert Hunt, F.R.S. second edition, revised and enlarged, containing the Lives of Watt, Rennie, Telford, Mylne, Jessop, Chapman, Murdock, the first to introduce gas into practical use; Rumford, Huddart, Boulton, Brunel, Waston, Bentham, Maudsley, Dalton, Cavendish, Sir Humphry Davy, Wollaston, Hatchet, Henry, Allen, Howard, Smith, the father of English Geology; Crompton, inventor of the Spinning Mule; Cartwright, Tennant, Ronalds, the first to successfully pass an electric telegraph message through a long distance; Charles Earl Stanhope, Trevithick, Nasmyth, Miller, of Dalswinton, and Symington, the inventors and constructors of the first practical Steam Boat; Professor Thomson, of Glasgow; Troughton, Donkin, Congreve, Herschel, Maskelyne, Baily, Frodsham, Leslie, Playfair, Rutherford, Dollond, Brown, the Botanist; Gilbert and Banks, the Presidents of the Royal Society at that epoch of time; Captain Kater, celebrated for his pendulum experiments; Dr. Thomas Young, and Jenner, the benefactor of mankind; Jas. Ivory, Dr. Priestly, and Cort, the father of the Iron Trade; post 8vo, cloth, 3s. 6d.

Mining.

On the Ventilation of Coal Mines, by William Brunton, *cuts*, 12mo, cloth, 6d.

E. & F. N. SPON, 16, BUCKLESBURY, LONDON.

Mining.

Records of Mining and Metallurgy, or Facts and Memoranda for the use of the Mine Agent and Smelter, by J. Arthur Phillips and John Darlington, in crown 8vo, cloth, *illustrated by wood engravings*, by F. Delamotte, reduced to 4s., in boards, 3s.

Millwrights' Guide.

The Practical Millwrights and Engineers' Ready Reckoner; or, Tables for Finding the Diameter and Power of Cogwheels, &c. &c., by Thos. Dixon, 12mo, cloth, 3s.

Modern Alphabets.

Examples of Modern Alphabets, plain and ornamental, including German, Old English, Saxon, Italic, Perspective, Greek, Hebrew, Court Hand, Engrossing, Tuscan, Riband, Gothic, Rustic, and Arabesque, with several original designs, and an analysis of the Roman and Old English Alphabets, for the use of Draughtsmen, Masons, Decorative Painters, Lithographers, Engravers, Carvers, Schools, &c., collected and engraved by F. Delamotte, royal 8vo oblong, cloth, 4s.

"To artists of all classes, but more especially to architects and engravers, this very handsome book will be invaluable."—*Standard*.

Modern Engineering.

A record of the progress of Modern Engineering, comprising Civil, Mechanical, Marine, Hydraulic, Railway Bridge, and other Engineering Works, with Essays and Reviews, edited by W. Humber, Associate Institute (Civil Engineers, and Member of the Institute of Mechanical Engineers, for 1863, imperial 4to, half morocco, £3 3s.

Do. do. for 1864, half morocco, £3 3s.

Oblique Bridges.

A practical Treatise on the Construction of Oblique Bridges, with spiral and with equilibrated courses, *with 12 plates*, containing 100 figures, by Francis Bashforth, M.A., Fellow of St. John's College, Cambridge, 8vo, cloth, 6s.

LIST OF BOOKS PUBLISHED BY

Ornament.

The Book of Ornaments of every style, applicable to Art and Industry, for the use of Lithographers, Engravers, Silversmiths, Decorators, and other Art Workmen, by Jos. Scheidel, 5 numbers, at 1s. 6d. each.

Ornament.

Gleanings from Ornamental Art of every style, drawn from examples in the British, South Kensington, Indian, Crystal Palace, and other Museums, the Exhibitions of 1851 and 1862, and the best English and Foreign Works, in a series of 100 *plates*, containing many hundred examples, by R. Newberry, 4to. cloth, 30s.

Perpetual Motion.

Perpetuum Mobile; or, Search for Self-Motive Power, during the 17th, 18th, and 19th Centuries, illustrated from various authentic sources in papers, essays, letters, paragraphs, and numerous patent specifications, with an Introductory Essay by Henry Dircks, C.E., *with numerous engravings of machines*, crown 8vo, cloth, 10s. 6d.

"A curious and interesting work. Mr. Dircks' chief purpose was to collect together all the materials requisite to form a record of what has been done, or attempted, rather, in this curious branch of *quasi science*, and most instructive in one sense it is. Mr. Dircks' volume is well worth looking into; it contains a vast deal of entertaining matter."—*Builder*.

Port of Calcutta.

The Port of Calcutta, with special reference to the late Cyclone, and remedial measures to be adopted, by Charles C. Adley, Esq., C.E., plates, 8vo, sewed, 2s.

Railways.

Holley's (A. L.) American and European Railway Practice, in the economical generation of Steam, including the materials and construction of coal-burning, boilers, &c., and the adaptation of wood and coke-burning engines to coal-burning, and in permanent way, &c, 77 *plates*, imp. 4to, cloth, 30s.

E. & F. N. SPON, 16, BUCKLESBURY, LONDON.

Railways.

Manual of Railway Engineering in Ireland, with Appendices, including the Irish Tramway Acts, by J. P. Cotton, *plates*, post 8vo, cloth, 5s.

Railway Masonry.

The Guide to Railway Masonry, containing a complete Treatise on the Oblique Arch, by Peter Nicholson, third edition, revised by R. Cowen, C.E. *with 42 plates*, 8vo, cloth, 9s.

Road Locomotives.

An Epitome of the New Road Locomotive Acts, for the use of Owners and Drivers, by Thomas Aveling, 18mo, cloth, 6d.

Screw Cutting.

Screw Cutting Tables, for the use of Mechanical Engineers, showing the proper arrangement of Wheels for cutting the threads of screws of any required pitch, with a Table for making the Universal Gas Pipe Threads and Taps, by W. A. Martin, Engineer, royal 8vo oblong, cloth, 1s., sewed, 6d.

Screw Propeller.

The Screw Propeller: what it is, and what it ought to be, by R. Griffith, 8vo, sewed, 6d.

Sewing Machine.

The Sewing Machine: its History, Construction, and Application, translated from the German of Dr. Herzberg, by Upfield Green, *illustrated by 7 large lithographic plates*, royal 8vo, ornamental boards, 7s. 6d.

Shop Fronts.

Delassaux and Elliott's Street Architecture: a series of Shop Fronts and Fagades, characteristic of and adapted to different branches of commerce, 22 *steel plates*, folio, boards, 12s. 6d.

Society of Engineers.

Transactions of the Society of Engineers, 1860 to 1862, *plates*, post 8vo, cloth, 8s. 6d.

The volume for 1863, cloth, 10s. 6d.

The volume for 1864, 8vo, cloth, 21s.

LIST OF BOOKS PUBLISHED BY

Specifications.

Practical Specifications of Works executed in Architecture, Civil and Mechanical Engineering, and in Road Making and Sewering; to which are added a series of practically useful Agreements and Reports, *with 15 folding plates*, by John Blenkarn, 8vo, cloth, 18s.

Steam.

Reed's (E. J.) New Theory of the Generation of Steam, with an explanation of the Geysers of Iceland, 8vo, sewed, 6d.

Steam Boilers.

Treatise on the Marine Boilers of the United States, by B. H. Bartol, *plates*, 8vo, cloth, 7s. 6d.

Steam Boilers.

The Modern Practice of Boiler Engineering, containing observations on the Construction of Steam Boilers, and remarks upon Furnaces used for Smoke Prevention, with a chapter on Explosions, by Robert Armstrong, C.E., revised, with the addition of Notes and an Introduction, by John Bourne, Esq., *with engravings*, fcap. 8vo, cloth, 2s.

"The collected experience of a practical engineer, who, for thirty years of his life, has directed his attention to the construction of Steam Boilers and Furnaces, is a valuable addition to the stock of Engineering knowledge, and it will be generally more appreciated because it is condensed within so small a volume as the one before us."—*Civil Engineers and Architects' Journal*.

Steam Boilers.

Steam Boiler Explosions, by Zerah Colburn, 8vo, sewed, 1s.

Steam Boilers.

On the Wear and Tear of Steam Boilers, by Frederick Arthur Paget, C.E., 8vo, sewed, 1s.

Steam Engine.

Lessons and Practical Notes on Steam, the Steam Engine, Propellers, &c., &c., for Young Engineers, Students, and others, by the late W. H. King, U.S.N., ninth edition, *cuts*, 8vo, cloth, 9s.

E. & F. N. SPON, 16, BUCKLESBURY, LONDON.

Steam Engine.

Practical Illustrations of Land and Marine Engines, shewing in detail the modern improvements of High and Low Pressure, Surface Condensation, and Super-heating, together with Land and Marine Boilers, by N. P. Burgh, Engineer, 20 *plates in double elephant*, folio, cloth, with text, £2 2s.

Steam Engine.

Rules for Designing, Constructing, and Erecting Land and Marine Engines and Boilers, by N. P. Burgh, Engineer, royal 32mo, roan, 4s. 6d.

Steam Engine.

The Slide Valve practically considered, by N. P. Burgh, *cuts*, crown 8vo, cloth, 4s.

Strength of Timber.

Practical Treatise on the Strength and Stiffness of Timber, intended as a Guide for Engineers, Architects, and Carpenters, by William Turnbull, 8vo, boards, 2s.

Sugar Machinery.

A Treatise on Sugar Machinery, by N. P. Burgh, Engineer, *with 16 plates, drawn to a large scale*, royal 4to, cloth, 30s.

Surveying.

An Introduction to the present practice of Surveying and Levelling, being a plain explanation of the subject and of the instruments employed, *illustrated with suitable plans, sections, and diagrams, also with engravings of the Field Instruments*, by S. C. Brees, C.E., 8vo, cloth, 3s. 6d.

Surveying.

A practical Treatise on the science of Land and Engineering Surveying, Levelling, Estimating Quantities, &c., with a general description of the several Instruments required for Surveying, Levelling, Plotting, &c., with *illustrations and tables*, by H. S. Merrett, royal 8vo, cloth, 16s.

Teeth of Wheels.

Camus (M.) Treatise on the Teeth of Wheels, demonstrating the best forms which can be given to

LIST OF BOOKS PUBLISHED BY

them for the purposes of Machinery, such as Mill work and Clock work, and the art of finding their numbers, translated from the French, new edition, carefully revised and enlarged, with details of the present practice of Millwrights, Engine Makers, and other Machinists, by Isaac Hawkins, *illustrated by 18 plates*, 8vo, cloth, 5s. (pub. 12s.)

Tobacco.

Tobacco; its History and Associations, including an Account of the Plant and its Manufacture, with its modes of use in all ages and countries, by F. W. Fairholt, 100 engravings, post 8vo, cloth, 4s. 6d.

Turbine.

A Practical Treatise on the construction of the Turbine, or Horizontal Water-wheel, *with seven plates*, specially designed for the use of Operative Mechanics, by William Cullen, Millwright and Engineer, 4to, sewed, 6s.

Turning.

Turners' and Fitters' Pocket-Book for calculating the change wheels for Screws on a Turning Lathe, and for a Wheel-cutting Machine, by J. La Nicca, 18mo, sewed, 6d.

Turning.

The practice of Hand-turning in Wood, Ivory, Shell, &c., with Instructions for Turning such works in Metal as may be required in the practice of Turning in Wood, Ivory, &c., also an Appendix on Ornamental Turning, by Francis Campin, *with wood engravings*, crown 8vo, cloth, 6s.

Wage Table.

Delany and Oke's Wage Table for Engineers, Shipbuilders, Contractors, Builders, &c., from one-quarter of an hour in regular progression to nine and three quarter hours, from one day to ten days, at one shilling to eight shillings per day, on one sheet, 1s.

E. & F. N. Spon, 16, BUCKLESBURY, LONDON.

Warming and Ventilating.

Bernan's (W.) History and Art of Warming and Ventilating Rooms and Buildings by Open Fires, Hypocausts, German, Dutch, Russian, and Swedish Stoves, Steam, Hot Water, Heated Air, Heat of Animals, and other Methods, &c, by W. Bernan, 243 *engravings*, 2 vols in 1, 12mo, cloth, 1s. 6d.

Water Supply.

Papers upon the supply of Water to Towns, by Baldwin Latham, C.E., A.I.C.E., *plates*, part I, 8vo, sewed, 3s. 6d.

Wine Management.

The Wine Merchant's Manual, a Treatise on the Fining, Preparation of Finings, and General Management of Wines, by T. Smeed, 12mo, boards, 1s.

Yacht Building.

Marrett's (P.R.) Yachts and Yacht Building, being a Treatise on the Construction of Yachts, and other matters relating to Yachting, 10 *large folding plates*, 8vo, cloth, 6s.

In 2 vols., royal 8vo, half morocco, neat, price £2 10s.

APPLETON'S
DICTIONARY OF MACHINES
MECHANICS,
ENGINE WORK, & ENGINEERING;
WITH
4000 ENGRAVINGS ON WOOD, AND MANY
STEEL PLATES.
EDITED BY OLIVER BYRNE.
NEW EDITION.

LONDON: E. & F. N. Spon, 16, BUCKLESBURY.

www.libtool.com.cn

*To be Published in Fifteen Monthly Parts, demy quarto,
price 3s. each part (Part 1 ready on the 1st January,
1866, and the remainder consecutively),*

**ILLUSTRATED WITH 30 CORRECTLY COLORED PLATES
AND NUMEROUS WOODCUTS.**

**MODERN
MARINE ENGINEERING,**

APPLIED TO

PADDLE & SCREW PROPULSION,

By N. P. BURGH, ENGINEER.

Just Published, elephant folio, cloth, price £2 2s.

**PRACTICAL ILLUSTRATIONS
OF
LAND AND MARINE ENGINES,**

SHOWING IN DETAIL

**THE MODERN IMPROVEMENTS IN HIGH AND LOW PRESSURE,
SURFACE CONDENSATION, SUPERHEATING,**

TOGETHER WITH

LAND AND MARINE BOILERS.

By N. P. BURGH, Engineer.

LONDON: E. & F. N. SPON, 16, BUCKLESBURY.

www.libtool.com.cn

www.libtool.com.cn

www.libtool.com.cn



www.libtool.com.cn