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MADRAS RECORD OFFICE

Government of Madras

Public works DEPARTMENT

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Not to be folded or roughly handled

Proceedings of the Madras Government, Public Works Department, 19th October 1874.

No. 434. Read the following letter from Lieutenant-Colonel J. H. M. SHAW-STEWART, R.E., Consulting Engineer for Railways, to Colonel G. W. WALKER, R.E., Secretary to Government, Public Works Department, dated Madras, 24th September 1874, No. 565:—

ADVERTING to the Proceedings of Government, under date the 11th November 1873, No. 2,740, I have the honor to submit, for consideration, a letter* from the Agent of the Madras Railway Company, in which Mr. Elwin represents that, before submitting a further proposal regarding the alteration of the Company's Rules and Regulations, it is necessary that the system upon which the trains are in future to be worked should be determined. He observes that the Government of India appear to be under the impression that the traffic on the Madras Railway is at present worked on the "line clear" system, whereas the "time-table" system is, and always has been, in force; and, in order to carry out the views of the Government of India, an entire change of system will be necessary.

* No. 822, 16th September 1874, with enclosures.

2. Upon this important question, the Agent submits reports from the Traffic Manager and the Telegraph Engineer. Both of these officers are strongly opposed to the introduction of the "line clear" system, being of opinion that it is not only decidedly inferior to the system now in force, but that it is likely to form a positive element of danger. They advocate the retention of the "time-table" system; and Mr. Winter is of opinion that great advantage would result from the introduction of a "non-meeting block" system as an auxiliary. To this suggestion Mr. Church objects on the score of e pense; he estimates that it would entail an annual additional cost of Rupees 75,000; which, in his opinion, the limited traffic on the Railway would not justify.

3. The Agent is also decidedly opposed to the introduction of the "line clear" system; and states that, looking at the limited number of the trains run, he does not consider it necessary, as regards safety in working, that the adoption of the "block" system should be enforced upon the Madras Railway.

4. The "time-table" system, under which the train service is now worked, has the double merit of economy and simplicity. The trains are worked to a time-table, upon which are noted the regularly appointed meeting stations with trains coming in the opposite direction. The power of altering these meeting stations is vested in the Traffic Manager and his Assistants in charge of divisions; and all possible precautions are taken to prevent misunderstandings. In the case of an extra or special train, every station and person concerned, throughout the distance such train is intended to run, receives previous notice, either in writing, or by telegraph which must be acknowledged, before such train can be started. These extra or special trains are ordered either to meet and pass ordinary trains at appointed meeting stations, or to "keep clear;" and a train ordered to "keep clear" must be at a station where an ordinary train is to be met at least 20 minutes before such ordinary train is due. There must be an interval of at least 15 minutes between the departure of two trains from any station in the same direction.

5. This system is not only simple and economical, but it has been proved during the last eighteen years to be well adapted to the light traffic of the Madras Railway, and to the degree of intelligence possessed by the employés upon whom its safe working depends. I cannot see that anything would be gained by the introduction of the "line clear" system in its place. Not only would the change entail great expense, in the shape of a station-to-station wire without which the "line clear" system could not be satisfactorily worked; but the objections to its adoption raised by Mr. Winter seem to me to possess great force.

6. There can be no doubt that the introduction of the "block" as an auxiliary to the "time-table" system, as proposed by Mr. Winter, would render that system almost perfect; but after giving the matter most careful consideration, I have arrived at the same conclusion with the Agent and the Traffic Manager, that, looking to the lightness of the traffic and the limited number of the trains now run upon the Madras Railway, the advantages which would result from the introduction of the "block" system would not justify the large outlay which would be thereby involved.

From R. B. ELWIN, Esq., Agent and Manager of the Madras Railway Company, to Lieutenant-Colonel J. H. M. SHAW-STEWART, R.E., Consulting Engineer for Railways, dated Madras, 16th September 1874, No. 822.

With reference to your letter of the 18th of November last, No. 1,107, with which was forwarded a copy of G. O., No. 2,740, dated the 11th idem, I have the honor to state that before submitting, for the consideration of Government, any further proposal with regard to the alteration of the Rules and Regulations in force on this Railway, it appears to be necessary that it should be determined whether or not the "block system" is to be adopted in future for the working of the trains.

2. With this view, upon receipt of your letter, I called upon the Traffic Manager and the Telegraph Engineer to report to me upon the subject, and I now beg to enclose, for submission to Government, copies of letters* addressed to me by those officers in which their views are fully expressed.

* From Traffic Manager, No. C 297, dated 4th September 1874.
From Telegraph Engineer, No. 75, dated 7th April 1874.

3. It appears from paragraph 9 of the letter which is embodied in the Government Order referred to above, that the Government of India is under the impression that the "line clear" system is that which is at present in force on the Madras Railway, but such is not the case, as the traffic on this line is, and always has been, worked on the "time-table" system.

4. Mr. Winter, the Company's Telegraph Engineer, who, as you are aware, is an officer of considerable experience, is of opinion that the line clear system as worked on some of the Railways in India is an absolute source of danger in working a single line of Railway; and while he advocates the adoption of the "block system" on this line, he proposes it merely as an auxiliary to the present "time-table" system, which he is strongly of opinion should, under no circumstances, be abolished.

5. I quite concur in Mr. Winter's views with regard to the "line clear" system, and I also think with him that, looking at the class of men we have to employ as signallers, it would be dangerous, and otherwise undesirable, to depend upon the block system alone for the working of the trains on this Railway. At the same time there is no doubt that the adoption of block instruments throughout the line would make our system of telegraphs more complete, and would to some extent relieve the officers of the Traffic Department of the heavy responsibility of altering meeting stations which now rests upon them.

6. This relief to the officers of the Traffic Department is the main reason which induces Mr. Winter to recommend the adoption of the block system, and I should be only too happy if such

relief could be afforded by abolishing altogether the "time-table" system which involves the occasional alteration of meeting stations. If, however, it is accepted, as I believe it must be, that, under any circumstances, the time-table system is to be retained, it appears to me to be by no means clear that it would be good policy to do any thing that would tend to lessen the sense of responsibility which should, in my opinion, be felt by the officers charged with the duty of altering meeting stations.

7. After careful consideration of the subject, I have no hesitation in expressing my opinion that, looking at the limited number of the trains run, it is not necessary, as regards safety in working, that the adoption of the block system should be enforced on the Madras Railway. It is possible that, as contemplated by the Government of India, its introduction may become necessary at some future time, but I trust that the Government will consider that, under existing circumstances, and with our present small traffic, any possible advantages that might result from it, would entirely fail to justify the large outlay and permanent addition to the working expenses of the Railway which the adoption of the system would entail.

8. As stated before, the submission of any further proposal with regard to this Company's Rules and Regulations will be delayed until the question of what system we are to work under is finally disposed of, and I hope therefore to be favored with the orders of Government upon the subject at an early date.

From H. E. CHURCH, Esq., Traffic Manager, to R. B. ELWIN, Esq., Agent and Manager of the Madras Railway Company, dated Madras, 4th September 1874, No. C-297 A & M.

Working of Trains.

With reference to Order of Government, dated 11th November 1873, No. 2,740, embodying a letter from the Government of India, dated 30th September 1873, No. 1,691 G. R., and to your letter of the 17th April 1874, No. 1,192, enclosing a report from the Telegraph Engineer upon the "block" and "line clear systems," I beg to offer the following observations.

2. Adverting to paragraph 9 of the letter from the Government of India, it is scarcely necessary to say that trains on this line are, and always have been, worked on the "time-table" system, and it will be seen that the Telegraph Engineer, who has always been a warm advocate of the "block system," considers "that to substitute the 'block' system for the present system would be attended with danger, and would certainly result in delays." This opinion deserves respect, as Mr. Winter has probably had greater opportunities than any other officer of forming a correct estimate of the capabilities of the class of men, employed as Telegraph Signallers, upon which we are dependent in this country.

3. While strongly advocating the introduction of the "block" system, Mr. Winter deprecates any change in the present system of working by time-table, which places the alteration in the regular running of trains in the hands of thoroughly competent officers. Indeed, he frankly admits that the object of the "block" system, as applied to the Madras Railway, is to relieve those charged with the alteration of "meeting stations" "of the feeling of the awful consequences of an oversight," and I understand from this that, if no alteration of meeting stations were permitted, there would be no necessity, in Mr. Winter's opinion, for the "block" system on the Madras Railway.

4. While fully prepared to admit that the responsibility of altering meeting stations is a very serious responsibility, I am of opinion that, within certain limits, the "feeling" referred to by Mr. Winter sits comparatively lightly on an officer who thoroughly understands his work, as his time-table is so vividly reflected in his mind that the alteration of the meeting stations of a train probably costs him much less uneasiness than any other part of his duty. By the words "within certain limits," I refer to the number of trains passing in each direction within a given time.

5. On the busiest portion of the Madras Railway, say between Madras and Arconum, the number of ordinary trains running on the single line is six in each direction, and these are occasionally supplemented, according to the necessities of the traffic, by extra trains which average 1·16 per diem, and never exceed 3 per diem, except on the occasion of the large festivals held at

Trivellore in January and July of each year, when for three days consecutively three special passenger trains are run daily in each direction. Trivellore is 26 miles from Madras, say 3½ miles of double, and 22½ miles of single line.

6. The following table exhibits the various portions of line next in importance in respect of trains :—

Line.	Between	Distance, Miles	No. of ordinary Trains in each direction.	Average daily number of extra Trains in each direction.	Maximum number of extra Trains in any one day.
1	2	3	4	5	6
South-West...	Arconum and Vellore	38	6	0·95	3
	Vellore and Jollarpett	51	4	0·96	3
	Jollarpett and Mulliapuram ...	48	4	1·20	3
(Ghaut) ...	Mulliapuram and Salem	27	4	1·70	3
	Salem and Erode	36	4	1·70	3
	Erode and Pothanore	59	3	0·66	2
(Ghaut) ...	Pothanore and Palghaut	31	2	0·16	2
	Palghaut and Beypore	74	2	0·45	2
Neilgherry Branch ...	Pothanore and Coimbatore	4	4		
	Coimbatore and Mettapoliem ...	22	1	.....	...
	Bangalore Branch	85	3	.....	...
North-West .	Arconum and Tirupetty	41	4	0 25	2
(Ghaut) ...	Tirupetty and Codoor	26	4	1·08	3
	Codoor and Cuddapah	52	2	1·05	3
	Cuddapah and Ghooty	96	2	1·03	3
	Ghooty and Adoni	50	2	0·90	2
	Adoni and Raichore...	43	2½	0·90	2
	Bellary Branch	32	1½	0·95	2
			2	0 01	1

Note.—The figures in column 4 represent the present train service which is the heaviest we have ever had. The figures in columns 5 and 6 are taken from the half-year ending June 1873, when a large quantity of material for the Nizam's State Railway was conveyed, requiring a special extra train service far in excess of any thing yet required for ordinary traffic.

7. It does not seem from the foregoing figures that there is any very great strain on the mind of a practical man in altering meeting stations on any part of the Madras Railway, and, looking at the question from Mr. Winter's point of view, it is very questionable whether the introduction of the "block" system is a necessity for safe working.

8. Passing over the consideration of the "line clear" system, as worked on some lines in India, and which, in my opinion, the Telegraph Engineer conclusively shows is an absolute *element of danger* in the working of a single line of Railway, I will consider the cost of working the "block" system on the Madras Railway.

9. I have no hesitation in saying that if the "block" system is to be introduced it must be made thoroughly efficient. The men employed to work the "block" instruments should not be required to perform any other work which would call them out of their office during their watch, and each watch should not exceed 8 hours with an interval of at least 12 hours off duty. It would be unreasonable to expect, and very dangerous to require, any Station Master, whose duties are necessarily multifarious, to attend to the "block" instruments.

10. On all parts of the line where *night* as well as *day* trains are run it would be necessary to employ three signallers at each station to ensure the attendance of one on all occasions. On parts of the line where day trains only are run, two signallers will be required.

11. The class of men employed for the "block" system between Royapooram and Veyasarpaudy are East Indians, and their pay ranges from 25 Rupees to Rupees 35 per mensem. These men, though reliable and sufficiently intelligent for this purpose, have scarcely the capacity for the work of telegraph operators or signallers, so that the estimate now submitted of the cost of

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working the "block" would probably have to be increased if it were determined to make telegraph operators of all "block" signallers. We find in practice that men of this class are more reliable than natives of the class who will accept service for the same money ; indeed, we have great difficulty in employing native labor fit for our purposes, as the bulk of the natives look for employment in the Government service, and apparently prefer to remain idle until they can secure it. But, under any circumstances, it is very difficult to find natives who realize responsibility, and those who can do so look for very much higher remuneration than we can afford to give.

12. The following estimate of the monthly cost of block signallers for the whole line is based on the present train service :—

Between	Number of Stations.	No. at each Station.	Total Number.	Rate.	Amount	Exclusive of Telegraph Operators now employed.
				RS.	RS.	
Madras and Arconum ...	6	3	18		450	Madras and Arconum.
Arconum and Vellore ...	4	3	10		250	2 Signallers at Vellore.
Vellore and Salem ...	9	3	27		675	Jollarpett and Salem.
Salem and Erode ...	2	2	4		100	Erode.
Erode and Pothanore ...	4	2	8		200	Pothanore.
Pothanore and Beypore...	12	2	24		600	Beypore.
Neilgherry Branch ...	2	1	2		50	Coimbatore and Mettapolliem.
Bangalore do. ...	4	3	12	25	300	Bangalore.
Arconum and Codoor ...	6	3	17		425	Arconum and one at Tirupetty.
Codoor and Cuddapah ...	4	3	12		300	Cuddapah.
Cuddapah and Ghooty ...	6	3	18		450	Ghooty.
Ghooty and Adoni ...	4	2	6		150	1 Signaller at Goondacul and Adoni.
Adoni and Raichore ...	2	2	4		100	Raichore.
Bellary Branch	1	2	2		50	Bellary.
Total...	...	...	164	25	4,100	

or nearly Rupees 50,000 per annum.

13. If to this be added the cost of the Telegraph Engineer's extra establishment, the interest on expenditure in putting up wires and instruments, and in building houses for the accommodation of "block" signallers at each of 65 stations, the annual additional expenditure will be very little, if any, short of three-quarters of a lakh of Rupees, which I would respectfully submit the present limited traffic on this line will scarcely justify.

From G. K. WINTER, Esq., Telegraph Engineer, to T. H. GOING, Esq., Acting Chief Engineer, dated Bangalore, 7th April 1874, No. 75.

I beg to forward with this my report on the proposed introduction of either the block or the line clear system on the Madras Railway, together with provisional estimates of the cost of erection of wires and instruments and the probable increase in the cost of maintenance of electric telegraph consequent upon the introduction of the block system.

2. According to my present ideas regarding the best form of instrument for carrying out the system as proposed in Section B, of paragraph 4 of my report, I think two wires will be necessary, but as I have not yet completed the design of the instrument, I am not able to speak decidedly upon the point.

3. With regard to the item of the Assistant Telegraph Engineer in the estimate of the probable increase in the cost of maintenance, it will be seen that I have only entered half the salary of an Assistant Engineer, as though the introduction of the block system would render this appointment necessary, yet the appointment would be very desirable even under present circum-

stances, and certainly we might consider that only half his attention will be directed to the maintenance of the block system.

Report on the proposed introduction of either the Block or the Line Clear System on the Madras Railway.

I.—*Definitions.*

It has been the custom recently among Telegraph Engineers to define the block system as that system by which trains are kept apart, upon the same line of rails, by certain and invariable intervals of space, instead of by uncertain and variable intervals of time; in this way it is made to include all methods by which this space system can be carried out. Thus, according to the definition, not only the "line clear" system (or the system of asking the question is the "line clear" and getting an answer in the affirmative before allowing a train to start,) but also the bell and the staff systems are included. Now I do not hold to any such definition, nor do I think it is generally so understood amongst Railway men.

I should define the block system as being, in addition to what is implied in the above definition, one in which there are certain permanent signals which indicate the condition of the line between any two stations with regard to its being either clear or blocked by trains running upon it.

It differs from the "line clear" and bell systems by the fact that in the block system, permanent visible signs aid the memory of the employés, and in some instruments prevent their being able to give a signal having the meaning of "line clear" unless the line is actually clear at the time.

II.—*The abolition of the present system of working by Time-table and Crossing orders not necessary or desirable.*

I have always been very anxious that this should be understood, and I have not only pointed it out in many conversations, but it has been explained in my letters on the subject. Knowing the class of men we have to deal with, and how much trouble I have had with them during my nine years' experience in this country, I should decidedly say that to substitute the block system for the present system would be attended with danger, and would certainly result in delays. In order that the traffic on a single line should be carried out with the best possible efficiency, a great amount of intelligence is necessary in altering meeting stations; it is a well known fact that if altering meeting stations be injudiciously carried out more delay is caused than that which such alterations are intended to remedy. A knowledge of the running and position of other trains than those immediately concerned, as well as of the distance, gradients, etc., between the different stations is necessary, and these things of course would not be known to the block signallers.

In our present system the whole conduct of the traffic is in the hands of men who have by long experience and education been well qualified to undertake this arduous and important duty. They are intimately acquainted with the section of the line under their charge, and are kept continually informed of the position and running of all the trains on their length, as well as of any unusual detention of trains on adjoining divisions. The time-table is, as a rule, adhered to, and if any alteration is rendered necessary by the detention of a train, the alteration of the ordinary meeting stations rests solely in the hands of men best fitted for making such arrangements. Special trains, except in very rare cases, are now run under a special time-table, and hence form part of the general system, and are as much under the control of the District Traffic Managers as are the ordinary trains. This system if supplemented by the block would be all that could be desired. Under the present system the Station Master before he starts a train has reason to believe that the line between his station and the next is clear, and, if no mistake has been made, it must of course be so, but if the block system were introduced as an auxiliary the Station Master, instead of having reason to believe that the line was clear, would have means to ascertain that it was so. There is a rule in the Railway Act that no train should be started from one station until it has been ascertained by telegraph that the line is clear to the next station; under the block system as an auxiliary this could be ascertained in the most reliable way possible.

III.—*Advantages of the Block System as an auxiliary.*

We have not had many collisions, but we have had two, and we very nearly have had several more. I need not point out that the collisions we have had would have been avoided, and the risk of having the others would never have occurred had the block system been in use. Any mistakes or oversights that may be made would, under this system, be immediately found out, and accidents, that would otherwise arise from them, would be avoided. Also, and this is a most important point, those on whom the responsibility of altering the meeting stations rests would be relieved, to a certain extent, from that feeling of the awful consequences that would, under present circumstances, result should any oversight be made by themselves or their subordinates; and while on this subject, I would point out that lately we have had several cases of false telegrams sent, and messages received by stations other than those for which they were intended. If any of these cases should occur with regard to the altering of meeting stations a collision would be inevitable. In the block system a Station Master is always certain that it is the next station he is speaking to, and hence there is no such danger to be feared.

It might be said that it would be unwise in any way to lessen the feeling of responsibility in those charged with the alteration of meeting stations. This is true, but it is not what I mean by relieving them to a certain extent of the feeling of the awful consequences of an oversight. The responsibility they *must* have, but the dread of the consequences of an error or oversight is a different thing. It cannot fail to have a prejudicial effect on the mind, and is more likely itself to cause, than to prevent a catastrophe.

Another important point is that ballast and special trains could be worked much more safely and easily than at present.

IV.—*Disadvantages of the Block System as an auxiliary.*

A—Expense.

The chief part of the cost of applying the system would be the extra signallers that would have to be employed.

I have always urged that our present system of making the Station Masters do the duty of signallers in addition to their other duties is very unsatisfactory, and I believe that the Madras Railway Company is the only large Indian Railway Company in which such an arrangement obtains. It is a notorious fact that most stations are most difficult to obtain except when a train is due; and the difficulty the Assistant Traffic Managers find in altering the meeting stations from this cause is best known to themselves. I say that each station should have its signallers, as on all other large Railways, and that these signallers should attend to the telegraph and to the block instruments, and to no other duty that would take them out of the signal-room. This would be attended with expense of course, but the extra facility of carrying on the ordinary work of the Company, and the lessening to a considerable extent of the present waste of time, patience, and the utility of the telegraph in simply calling stations that would result, should, I think, be well considered. But although it would be very desirable to have special signallers at all stations, I think that an exaggerated idea has been formed as to the number absolutely required in order to carry out the block system; in fact, I see no more reason why the Station Master should not attend to the block instruments himself, than there is against the present plan wherein he is his own signaller. As it is, unless he is within call of the instrument, meeting stations cannot be altered. It would not be too much, I think, to expect him to be at the station at the times trains are due at the stations on either side of him. At all events an assistant to the present Station Master, in cases where the Station Master at present does all the work, would, in my opinion, fully suffice to enable the block system to be carried out. There has been a rule that when a Station Master is forced to be absent from the signal office he should leave there a peon, able to recognise the call of his station. Now very few peons have been able to do this, and the rule has become a dead letter, but in the block system there is no call signal, and the peon would only have to watch for the movement of the needle, or ringing of the bell, etc., according to the system employed. No danger could result, but only a chance of delay. But I would certainly advise the locking up of all keys connected with the block instruments during the absence of responsible people. If native

assistants be employed I do not think special accommodation for them would be necessary in the majority of cases. Certain hours should be laid down, during which either the Station Master or his assistant should be on duty, and at all other times a peon should be on duty to watch for signals and to give warning should they come.

B.—*Delay to Trains travelling in the same direction.*

In dealing with this question we must understand that there are two distinct kinds of block system—

1*st.*—There is that which on a double line prevents trains from following too quickly after each other; this is called a non-following block system.

2*nd.*—There is a non-meeting block system, which prevents the use of a given section of single line by more than one train at a time.

I have been for some time working at the improvement of this second system. What I am trying to do is to get an instrument which will allow two or three trains to follow each other and indicate how many trains are on the line travelling in the same direction, each train being unblocked as it arrives at the next station. There would, of course, be no more danger in allowing trains to follow each other then than there is now, and I do not think any non-following block is wanted with our limited traffic.

C.—*Carelessness of employés endangered by the feeling of security arising from the application of the Block System.*

Captain Tyler has so well expressed his views on this subject in his report on accidents for 1872, that I cannot do better than quote an extract from that report:—

"It is a favorite argument with those who oppose the introduction of some of these improvements, or who make excuses for the want of them, that their servants are apt to become more careless in the use of them, in consequence of the extra security which they are believed to afford; and it is desirable to consider seriously how much of truth there is in the assertion. There may no doubt be a tendency sometimes on the part of Engine Drivers who are working under a block system to consider that the line is certain to be clear of trains a-head of them, and not therefore to keep so good a look out between the signal cabins.

"The guards and breaksmen also, under similar circumstances, do not see naturally the same necessity for running back to warn following trains in the event of an unusual stoppage, when they are working under the protection of the block system, as when they are aware that safety depends on their unaided exertions.

"In order to counteract these tendencies on the part of servants, stricter discipline is required; and it should be remembered that the block system is not intended to supersede the use of signals, or to obviate the necessity for exceptional protection in cases of unusual stoppage.

"But, making the most of these tendencies to confide too much in additional means of safety, the risk is proved by experience to be incomparably greater without them than with them; and, in fact, the negligence or mistakes of servants is found to occur most frequently, and with the most serious results, not when the men are over-confident in their appliances or apparatus, but when, in the absence of them, they are habituated to risk in the conduct of the traffic.

"The more they are accustomed to incur risk in order to carry on their business, the less they think of it, and the more difficult it is to enforce discipline and obedience to regulations. The personal risk which is encountered by certain class of Railway servants has never yet been precisely ascertained, but it is, as shown by the proportionate number of casualties, very great, and it is difficult, under any circumstances, to prevent men who are in constant danger themselves from doing things which may be a source of danger to others, or at all events from strictly obeying regulations for which they do not see altogether the necessity, and which impede them in their work."

V.—Line clear system—Definitions.

As I understand the regulation in paragraph 2 of Section 1 made in conformity with Section 29 of Act XVIII. of 1854, the line clear system is as follows:—

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"No engine, with or without a train, shall be permitted to leave one station for another until it shall have been ascertained by means of the electric telegraph that the line between those two stations is clear of engines and trains, and of all impediments, so far as can be known."

According to Colonel Dicken's letter, No. 1,691, paragraph 8, it appears that, although it was originally intended that the line should not be considered clear unless it was clear of all engines or trains travelling in either direction, it has been generally held that the line is to be considered clear for a following train, if a sufficient interval of time has elapsed since the departure of the last train travelling in the same direction between the two stations, even though it may not have arrived at the next station.

VI.—The Line clear system wrong in principle.

C and D are two stations on a single line of Railway. C wishes to start a train towards D, and is required by the line clear system to find out from D whether the line is clear, a question he is much better able himself to answer than D is, for he must know better than D, whether the last train travelling towards C, for which D had asked and C had given "line clear," had arrived at C; and again he must know best himself, whether a sufficient interval has elapsed since he sent the last train towards D.

VII.—The Line clear system dangerous in practice.

When a system is wrong thus in principle, it is only to be expected that it should lead to mistakes. To give an example: D asks C, is line clear? C answers yes, and a train starts. The train is delayed on the road, and C some time after, forgetting that a train was coming, asks D, is line clear? D thinking that C would not have asked the question unless the previous train had arrived, answers yes, and C starts his train in the teeth of the delayed train from D. A collision occurs, and who is to blame. Certainly, in my opinion, the system, more than either of the signallers, and of the signallers C is more to blame than D, because C's act was one of forgetfulness, whereas D had no means of knowing whether the line was clear or not.

The line clear system, as usually carried out, has another great danger, viz., that a man, when he calls the next station, is never sure that it is the next station who is answering him. This could be remedied by having the circuit only from station to station, but this would involve an additional wire, and in that case why not have the block system at once, and save all chance of forgetfulness on the part of the employés.

VIII.—The proper line clear system.

If, however, for the sake of economy, it should be determined not to have the block system, which I have already shown should be only an auxiliary, but that the line clear system should be used as an auxiliary; then, when a man at C wants to start a train towards D, he should call D, and state his intention to do so, and ask D to let him know when it arrives. Of course this might be done in code. A train register book should be kept open by the side of the instrument, giving, in a proper tabulated form, the times at which all such transactions take place, so that there would be some aid to the memory. This would no doubt be some check, and would, as an auxiliary, be of some value, but it would never do to make it the sole method of working the traffic.

IX.—Conclusion.

To sum up, I think it cannot be denied that our present system of conducting the traffic on long lengths of single line by means of a time-table and crossing orders, is the best that could be devised. It is, I believe, in use on the Great American Lines, which are far more analogous to our own than any of the English lines. At the same time great advantage would result from the introduction of the block system as an auxiliary. It could not possibly clash with our present system, unless some mistake had been made; and in that case this very clashing would lead to the discovery of the mistake, and prevent the accident that would otherwise arise.

(Signed) G. K. WINTER.
Telegraph Engineer.

BANGALORE,
7th April 1874.

MADRAS RAILWAY.

ELECTRIC TELEGRAPH DEPARTMENT.

Estimate of the cost of Instruments, Stores, etc., required for putting up two wires of No. 8 B. W. G. on the existing poles on account of the introduction of Block System.

Description.	No.	Rate.	To be expended Departmentally.	To be drawn from Stores.	Total.
		RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Iron wire, galvanised, No. 8, lbs.	389	0 1 9	.....	42 8 9	
Do. do. ,, 14, ,,	1	0 2 3	.....	0 2 3	
Do. do. ,, 1 ,,	2	0 2 3	.....	0 4 6	
Siemen's Insulators, Nos. 10, and 12, stretching Pairs.	3	4 5 10	.....	13 1 6	
Siemen's Insulators, Nos. 9 and 11, intermediate Pairs.	17	1 14 6	.....	31 15 6	
Solder ... ... lbs.	4	0 6 0	.....	1 8 0	
Salamoniac... ... ... ,,	¼	0 5 0	.....	0 1 3	
Muriatic Acid ... ... ,,	¼	0 2 0	.....	0 0 6	
Freight and Insurance on the value of stores 10 per cent. Rs.	100	10 0 0	.....	8 14 6	
Labor for putting up one mile. ,,	...	.....	10 0 0	.....	
Contingencies 10 per cent. on the value of stores and labor ... ... ,,	100	10 0 0	1 0 0	8 7 3	
Per mile.	...	...	11 0 0	107 0 0	118 0 0
For 859 Miles.	...	.....	9,449 0 0	91,913 0 0	1,01,362 0 0
Cost of apparatus for block circuit ... ... Circuit.	82	400 0 0	.....	.....	32,800 0 0
Total Estimate	...	...	.....	.....	1,34,162 0 0

(Signed) G. K. WINTER,
Telegraph Engineer.

MADRAS RAILWAY.

ELECTRIC TELEGRAPH DEPARTMENT.

Probable Increase in the cost of Maintenance of the Electric Telegraph consequent upon the introduction of the Block system.

Particulars.	Amount per Mensem.
	RS. A. P.
Workshop expenses for repairs of Instruments, etc.	600 0 0
Half salary of an Assistant Telegraph Engineer...	242 0 0
Office Establishment	100 0 0
Extra Inspectors...	200 0 0
Total...	1,142 0 0

(Signed) G. K. WINTER,
Telegraph Engineer.

Proceedings of the Madras Government, Public Works Department,
19th October 1874.

No. 435. ORDER THEREON, 19th October 1874, No. 2,981.

RAILWAY, No. 63.

COMMUNICATED for orders of the Government of India with remark that the principle on which the Madras Railway is worked appears not to have been clearly understood; the "line clear" system not having been in use, but (in the opinion of the Madras Government with marked success) the "time-table" system. No doubt, however, additional security would be gained from supplementing it by the block system; if it could be afforded.

(True Extract.)

(Signed) G. W. WALKER, Colonel, R.E.,
Secretary to Government.

No. 436. (DOCKET, No. 2,982, dated 19th October 1874.)
COPY of the above forwarded to the Government of India.

(True Extract.)

Colonel, R.E.,
Secretary to Government.

Exd. T. O'Connor.

Spare Copies

(13R)

Railway Department.

CONSULTING ENGINEER'S OFFICE.

No. 565

From

LIEUT.-COLONEL J. H. M. SHAW STEWART, R.E.,

Consulting Engineer for Railways,

To

COLONEL G. W. WALKER, R.E.,

Secretary to Government,

Public Works Department.

Fort Saint George.

SIR,

Adverting to the Proceedings of Government under date the 11th November 1873, No 2740, I have the honour to submit for consideration a letter* from the Agent of the Madras Railway Company, in which he brings forward a further proposal regarding the alteration of the Company's Rules and Regulations, it is necessary that the system upon which the trains are in future to be worked

* No 822 16 Septr. 74 with enclosures

(13R)

Railway Department.

CONSULTING ENGINEER'S OFFICE.

No. 565

From

LIEUT.-COLONEL J. H. M. SHAW STEWART, R.E.,

Consulting Engineer for Railways,

To

COLONEL G. W. WALKER, R.E.,

Secretary to Government,

Public Works Department.

Fort Saint George.

SIR,

Adverting to the Proceedings of Government under date the 11th November 1873, No 2740, I have the honour to submit for consideration a letter* from the Agent of the Madras Railway Company, in which he represents that, before submitting a further proposal regarding the alteration of the Company's Rules and Regulations, it is necessary that the system upon which the trains are in future to be worked

* No 822 16 Septr. 74 with enclosures

worked should be determined. He observes that the Government of India appear to be under the impression that the traffic on the Madras Railway is at present worked on the "line clear" system, whereas the "timetable" system is, and always has been, in force; and, in order to carry out the views of the Government of India, an entire change of system will be necessary.

2. Upon this important question the Agent submits reports from the Traffic Manager and the Telegraph Engineer. Both of these officers are strongly opposed to the introduction of the "line clear" system, being of opinion that it is not only decidedly inferior to the system now in force, but that

that it is likely to form a positive element of danger. They advocate the retention of the "time-table" system; and Mr. Winter is of opinion that great advantage would result from the introduction of a "non-meeting block" system as an auxiliary. To this suggestion Mr. Church objects on the score of expense; he estimates that it would entail an annual additional cost of ~~Rs~~ £5,000; which in his opinion the limited traffic on the railway would not justify.

3. The Agent is also decidedly opposed to the introduction of the "line clear" system; and states that, looking at the limited number

of

from any station in the same direction.

5. This system is not only simple and economical, but it has been proved during the last eighteen years to be well adapted to the light traffic of the Madras Railway, and to the degree of intelligence possessed by the employés upon whom its safe working depends. I cannot see that anything would be gained by the introduction of the "line clear" system in its place. Not only would the change entail great expense, in the shape of a station-to-station wire without which the "line clear" system could not be satisfactorily worked; but the objections to its adoption raised by Mr. Winter seem to me to possess great force.

6. There can be no doubt that the introduction of the "block" as an auxiliary to the "time-table" system, as proposed by Mr. Winter, would render that system almost perfect; but after giving the matter most careful consideration, I have arrived at the same conclusion with the Agent and the Traffic Manager, that, looking to the lightness of the traffic and the limited number of the trains now run upon the Madras Railway, the advantages which would result from the introduction of the "block" system would not justify the large

large outlay which would be thereby involved.

I have the honour to be
Sir
Your
[signature]
Mantewart St. Col. R.E.
Cons. Engineer for
Railways

Madras
24 Septr
1874
[illegible]

434

Dep. Sec. Acts 26 Sept 74

P. W. 1874 Department
Pro. Offg. Sec. Acts

RAILWAY DEPARTMENT.

From No. 6017
The Consulting Engineer
for Railways,

To
The Secretary to Government,
P. W. Department,
Fort Saint George.

Dated 24 September 1874.
Recd. 25

Enc: 4. No. 565.

Letter from the Agent & Ry Reporting on the subject of inadequate block system in future for the working of the trains

No. 822

MADRAS RAILWAY. 21k

AGENT AND MANAGER'S OFFICE.

Madras, 16th September 1874.

From
R. B. Elwin Esqr.
Agent and Manager. M. R. Co.

To
Lt Col. J. H. M. Shaw Stewart, R.E.
Consulting Engineer for Railways.

SIR,

With reference to your letter of the 18th of November last, No. 1107, with which was forwarded a copy of Government Order No. 2740 dated the 11th idem, I have the honour to state that before submitting for the consideration of Government any further proposal with regard to the alteration of the Rules and Regulations in force on this Railway, it appears to be necessary that it should be determined whether or not the "Block system" is to be adopted in future for the working of the trains.

2 With this view, upon receipt of your letter, I called upon the Traffic Manager, and the Telegraph Engineer to report to me upon the subject, and I now beg to enclose for submission to Government copies of letters addressed to me by those Officers in which their

Traffic Manager No. C 297 September 1874. Telegraph Engineer No. 75 April 1874.

views are fully expressed.

3. It appears from paragraph 9 of the letter which is embodied in the Government Order referred to above that the Government of India is under the impression that the "Line Clear" system is that which is at present in force on the Madras Railway, but such is not the case, as the Traffic on this line is, and always has been, worked on the "Time Table" system.

4. Mr Winter the Company's Telegraph Engineer, who as you are aware, is an Officer of considerable experience, is of opinion that the Line Clear system as worked on some of the Railways in India, is an absolute source of danger in working a single line of railway; and while he advocates the adoption of the "block system" on this line, he proposes it merely as an auxiliary to the present "Time Table" system, which he is strongly of opinion should under no circumstances be abolished.

5. I quite concur in Mr Winter's views with regard to the "Line Clear" system and I also think with him that looking at the class of men we

27k

7. After careful consideration of the subject I have no hesitation in expressing my opinion that looking at the limited number of the trains run, it is not necessary as regards safety in working, that the adoption of the Block system should be enforced on the Madras Railway. It is possible that, as contemplated by the Government of India, its introduction may become necessary at some future time, but I trust that the Government will consider that under existing circumstances and with our present small traffic any possible advantages that might result from it, would entirely fail to justify the large outlay and permanent addition to the working expenses of the railway which the adoption of the system would entail.

8. As stated before, the submission of any further proposal with regard to this Company's Rules and Regulations will be delayed until the question of what system we are to work under is finally disposed of, and I hope therefore to be favoured with the order of Government upon the subject at an early date.

I have the honour to be,
Sir,
Your most obedient Servt

[signature]
Agent & Manager

Ed pd

From

The Agent and Manager.

To

The Consulting Engineer

for Railways.

Dated

Recd.

187

No.

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer

for Railways.

Dated 17th 3 September 1874.

Recd. 17 Nov

No. 122

Regarding the alteration of the Rules and Regulations in force on the Madras Railway.

O.W. No 17/74

4

Pg. 7/19 Oct 74

In B No. 434

29k

Madras Railway Company
Traffic Manager's office
4th September 1874.

C/297
A&M.

Agent and Manager, M. R. Co.

Dear Sir,

Working of Trains.

With reference to Order of Government dated 11th November 1873, No. 2740, embodying a letter from the Government of India, dated 30th September 1873 No. 1691 G. R., and to your letter of the 17th April 1874 No. 1192, enclosing a Report from the Telegraph Engineer upon the "Block" and "Line Clear Systems", I beg to offer the following observations.

2. Adverting to para 9 of the letter from the Government of India, it is scarcely necessary to say that Trains on this Line are, and always have been worked on the "Time Table" System, and it will be seen that the Telegraph Engineer, who has always been a warm advocate of the "Block System", considers that to substitute the "Block" System for the present System would be attended with danger, and would certainly result in delays. This opinion deserves respect, as Mr Winter has probably had greater opportunities than any other Officer of forming a correct estimate of the capabilities of the class of men, employed as Telegraph Signallers, upon which we are dependent in this Country.

3. While strongly advocating the introduction of the "Block" System, Mr Winter deprecates any change in the present System

of working by Time Table, which places the alteration in the regular running of Trains in the hands of thoroughly competent Officers. Indeed he frankly admits that the object of the Block System, as applied to the Madras Railway, is to relieve those charged with the alteration of "Meeting stations" of the feeling of the awful consequences of an oversight; and I understand from this that, if no alteration of Meeting stations were permitted, there would be no necessity in Mr Winter's opinion, for the Block System on the Madras Railway.

4. While fully prepared to admit that the responsibility of altering Meeting stations is a very serious responsibility, I am of opinion that, within certain limits, the feeling referred to by Mr Winter sits comparatively lightly on an Officer who thoroughly understands his work, as his Time Table is so vividly reflected in his mind that the alteration of the Meeting Station of a Train probably costs him much less uneasiness than any other part of his duty. By the words "within certain limits" I refer to the number of Trains passing in each direction within a given time.

5. On the busiest portion of the Madras Railway say between Madras and Arconum, the number of ordinary Trains running on the Single Line is 6 in each direction, and these are occasionally supplemented, according to the necessities of the Traffic, by extra Trains which average 1.16 per diem, and never exceed 3 per diem, except on the occasion of the large Festivals held at Trivellore in January and July of each year, when for 3 days consecutively 3 special Passenger Trains are run daily in each direction. Trivellore is 26 miles from Madras say 3½ miles of Double, and 22½ miles of Single Line.

6. The following Table exhibits the various portions of Line next in importance in respect of Trains:

1	2		3	4	5	6
Line	Between		Distance Miles	No of ordinary Trains in each direction	average daily number of extra Trains in each direction	Maximum number of extra Trains in any one day
South West	Arconum &	Vellore	38	6	0.95	3
	Vellore	Jollarpett	51	4	0.96	3
	Jollarpett	Mullapuram	48	4	1.20	3
(Ghaut)	Mullapuram	Salem	27	4	1.70	3
	Salem	Erode	36	4	1.70	3
	Erode	Pothanore	59	3	0.66	2
(Ghaut)	Pothanore	Palghaut	31	2	0.16	2
	Palghaut	Beypoor	74	2	0.45	2
Neilgherry Branch	Pothanore	Coimbatore	4	4	"	"
	Coimbatore	Mettapalliam	22	1	"	"
	Bangalore	Branch	85	3	0.25	2
North West	Arconum &	Tirupetty	41	4	1.08	3
(Ghaut)	Tirupetty	Codoor	26	4	1.05	3
	Codoor	Cuddapah	52	2	1.03	3
	Cuddapah &	Ghooty	96	2	0.90	2
	Ghooty	Adoni	50	2½	0.90	2
	Adoni	Raichore	43	1½	0.95	2
	Bellary	Branch	32	2	0.01	1

Note.— The figures in columns 4 represent the present Train Service which is the heaviest we have ever had. The figures in columns 5 and 6 are taken from the Half year ending June 1873, when a large quantity of material for the Nizam's State Railway was conveyed, requiring a special extra Train Service far in excess of any thing yet required for ordinary Traffic.

7. It does not seem from the foregoing figures that there is any very great strain on the mind of a practical man in altering meeting stations on any part of the Madras Railway, and, looking at the question from Mr Winter's point of view, it is very questionable whether the introduction of the "Block" System is a necessity for safe working.

8. Passing over the consideration of the "Line Clear" System, as worked on some Lines in India, and which, in my opinion, the Telegraph Engineer conclusively shows is an absolute element of danger in the working of a Single Line of Railway, I will consider the cost of working the "Block" System on the Madras Railway.

9. I have no hesitation in saying that if the "Block" System is to be introduced it must be made thoroughly efficient. The men employed to work the "Block" Instruments should not be required to perform any other work which would call them out of their Office during their Watch, and each watch should not exceed 8 hours with an interval of at least 12 hours off duty. It would be unreasonable to expect, and very dangerous to require, any Station Master, whose duties are necessarily multifarious, to attend to the "Block" Instruments 10. On all parts of the Line where night as well as day Trains are run it would be necessary to employ 3 Signallers at each Station to ensure the attendance of one on all occasions. On parts of the Line where day Trains only are run 2 Signallers will be required

11. The Class of men employed for the "Block" System between Royapooram and Vepery are Coast Indians, and their pay ranges from 25 Rs. to Rs 35 per mensem. These men, though reliable and sufficiently intelligent for this purpose, have scarcely the capacity for working the "Block" would probably have to be increased if it were determined to make Telegraph operators of all "Block" Signallers. We find in practice that men of this class are more reliable than natives of the class who will accept service for the same money; indeed we have great difficulty in employing native Labour fit for our purposes, as the bulk of the natives look for employment in the Government Service, and apparently prefer to remain idle until they can secure it. But under any circumstances it is very difficult to find natives who realize responsibility, and those who can do so look for very much higher remuneration than we can afford to give.

12. The following Estimate of the month

Note.— The figures in column 4 represent the present Train Service which is the heaviest we have ever had. The figures in columns 5 and 6 are taken from the Halfyear ending June 1873, when a large quantity of material for the Nizam's State Railway was conveyed, requiring a special extra Train Service far in excess of any thing yet required for ordinary Traffic.

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to expect, and very dangerous to require, any station master, whose duties are necessarily multifarious, to attend to the "Block" Instruments.

10. On all parts of the Line where night as well as day Trains are run it would be necessary to employ 3 signallers at each station to ensure the attendance of one on all occasions. On parts of the Line where day Trains only are run 2 signallers will be required.

11. The Class of men employed for the "Block" System between Royapooram and Veyasarpandy are East Indians, and their pay ranges from 25 Rs. to Rs 35 per mensem. These men, though reliable and sufficiently intelligent for this purpose, have scarcely the capacity for the work of Telegraph Operators or Signallers, so that the estimate now submitted of the cost of working the "Block" would probably have to be increased if it were determined to make Telegraph operators of all "Block" Signallers. We find in practice that men of this Class are more reliable than natives of the Class who will accept service for the same money; indeed we have great difficulty in employing native Labour fit for our purposes, as the bulk of the natives look for employment in the Government Service, and apparently prefer to remain idle until they can secure it. But under any circumstances it is very difficult to find natives who realize responsibility, and those who can do so look for very much higher remuneration than we can afford to give.

12. The following Estimate of the month

Note.— The figures in columns 4 represent the present Train Service which is the heaviest we have ever had. The figures in columns 5 and 6 are taken from the Half year ending June 1873, when a large quantity of material for the Nizam's State Railway was conveyed, requiring a Special Extra Train Service far in excess of any thing yet required for ordinary Traffic.

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8. Passing over the consideration of the "Line Clear" System, as worked on some Lines in India, and which, in my opinion, the Telegraph Engineer conclusively shows is an absolute element of danger in the working of a Single Line of Railway, I will consider the cost of working the "Block" System on the Madras Railway.

9. I have no hesitation in saying that if the "Block" System is to be introduced it must be made thoroughly efficient. The men employed to work the "Block" Instruments should not be required to perform any other work which would call them out of their Office during their Watch, and each watch should not exceed 8 hours with an interval of at least 12 hours off duty. It would be unreasonable to expect, and very dangerous to require, any Station Master, whose duties are necessarily multifarious, to attend to the "Block" Instruments.

10. On all parts of the Line where night as well as day Trains are run it would be necessary to employ 3 Signallers at each Station to ensure the attendance of one on all occasions. On parts of the Line where day Trains only are run 2 Signallers will be required.

11. The Class of men employed for the "Block" System between Royapooram and Vegavanpundy are East Indians, and their pay ranges from 25 Rs. to Rs 35 per mensem. These men, though reliable and sufficiently intelligent for this purpose, have scarcely the capacity for the work of Telegraph Operators or Signallers, & that the estimate now submitted of the cost of working the "Block" would probably have to be increased if it were determined to make Telegraph Operators of all "Block" Signallers. We find in practice that men of this class are more reliable than natives of the class who will accept service for the same money; indeed we have great difficulty in employing native Labour fit for our purposes, as the bulk of the natives look for employment in the Government Service, and apparently prefer to remain idle until they can secure it. But under any circumstances it is very difficult to find natives who realize responsibility, and those who can do so look for very much higher remuneration than we can afford to give.

12. The following Estimate of the monthly

Cost of Block Signallers for the whole Line is based on the present Train Service.

Between		Number of stations	No. at each station	Total number	Rate	Amount		Exclusive of Telegraph operators now employed
Madras and	Arconum	6	3	18	25/	450	"	Madras & Arconum
Arconum "	Vellore	4	3	10	"	250	"	2 signals at Vellore
Vellore "	Salem	9	3	27	"	675	"	Jollarpett & Salem
Salem "	Erode	2	2	4	"	100	"	Erode
Erode "	Pothanore	4	2	8	"	200	"	Pothanore
Pothanore "	Beypoor	12	2	24	"	600	"	Beypoor
Neilgherry	Branch	2	1	2	"	50	"	Coimbatore & Mettapolliem
Bangalore	Branch	4	3	12	"	300	"	Bangalore
Arconum &	Coodoor	6	3	17	"	425	"	Arconum & one at Tirupetty
Coodoor "	Cuddapah	4	3	12	"	300	"	Cuddapah
Cuddapah "	Ghooty	6	3	18	"	450	"	Ghooty
Ghooty "	Adoni	4	2	6	"	150	"	1 signaller at Joondacul & Adoni
Adoni "	Raichoor	2	2	4	"	100	"	Raichore
Bellary	Branch	1	2	2	"	50	"	Bellary
		Total		164	25	4,100	Rs	

or nearly Rs. 50,000 per annum.

73. If to this be added the cost of the Telegraph Engineer's extra Establishment, the Interest on expenditure in putting up wires and Instruments, and in building houses for the accommodation of "Block" Signallers at each of 65 stations, the annual additional expenditure will be very little if any short of three quarters of a lac of Rupees, which I would respectfully submit the present limited Traffic

Traffic on this Line will scarcely justify.

Yours faithfully
Hoy H. E. Church
Traffic Manager.

(True Copy)

[signature]
Agent & Manager.

J.K.

P.W. 6017/74
3
Pg. 719 Oct/74
In B. No. 434

No 75.

Madras Railway Tel Engineers Office
Bangalore 7 April 1874.

My dear Sir

I beg to forward with this my report on the proposed introduction of either the Block or the line clear System on the Madras Railway, together with provisional estimates of the cost of erection of Wires and Instruments and the probable increase in the cost of Maintenance of Electric Telegraph consequent upon the introduction of the Block System.

According to my present ideas regarding the best form of instrument for carrying out the system as proposed in section B of paragraph 4 of my report, I think two wires will be necessary, but as I have not yet completed the design of the Instrument, I am not able to speak decidedly upon the point.

With regard to the item of the Assistant Telegraph Engineer in the Estimate of the probable increase in the cost of Maintenance it will be seen that I have only entered half the Salary of an Assistant Engineer as though the introduction of the Block System would render this appointment necessary yet the appointment would be very desirable even under present circumstances, and certainly we might consider that only half his attention will be directed to the Maintenance of the Block System.

Yours very truly
(Signed) J. K. Winter
Telegraph Engineer

To

The Ag. Chief Engineer
Madras.

39/12

Madras Railway Electric Telegraph Department

Estimate of the cost of Instruments, Stores &c required for putting up two wires of No 8. B. W. G. on the existing holes on account of the introduction of Block System

Description	No	Date	To be expended Departmentally	To be drawn from Stores	Total
Iron Wire Galvanised No 8 — lbs	389	1-9	"	42 8 9	
— " — " — No 14 "	1	2-3	"	2 3	
— " — " — No 16 — "	2	2-3	"	4 6	
Siemens Insulators No 10 & 12. Stretching — Pairs	3.	4-5-10	"	13 1 6	
Siemens Insulators Nos 9 & 11 Intermediate — Pairs	17	1-14-6	"	31 15 6	
Solder — lbs	4	6	"	1 8	
Salamoniac — "	1/4	5	"	1 3	
Muriatic Acid — "	1/4	2	"	6	
Freight and Insurance on the value of Stores 10% — Rs	100	10	"	8 14 6	
Labour for putting up one mile			10	"	
Contingencies 10 per cent on the value of Stores and Labour — "	100	10	1	8 7 3	
			11	107	118
Per Mile — Rs			9449	91913	101362
For 857 Miles					32800

Cost of Apparatus for [illegible]

Circuit — Circuit [illegible]

Total Estimate Rs

signed G. K. Winter
Tel: Engineer

Madras Railway Electric Telegraph Department

Probable increase in the cost of Maintenance of the Electric Telegraph consequent upon the introduction of the Block System

Particulars	Amount per mensem		
Workshop Expenses for repairs of Instruments &c	600	"	"
Half salary of an Asst Telegraph Engineer	242	"	"
Office Establishment	100	"	"
Extra Inspectors	200	"	"
Total Rupees	1142	"	"

(Signed) G. K. Winter
Tel. Engineer

(True Copies)

[signature]
Agent and Manager

P.W. 6017/74
Pg. 719 Oct 74
In B.N. 434

Report on the proposed introduction of either the Block or the Line Clear System on the Madras Railway.

1st Definitions.

It has been the custom recently among Telegraph Engineers to define the Block System as that System by which trains are kept apart, upon the same Line of Rails, by certain and invariable intervals of space, instead of by uncertain and variable intervals of time; in this way it is made to include all methods by which this space system can be carried out. Thus, according to the definition, not only the "Line Clear" System (or the System of asking the question is the "Line Clear" and getting an answer in the affirmative before allowing a train to start,) but also the Bell, and the Staff Systems are included. Now I do not hold to any such definition, nor do I think it is generally so understood amongst Railway men.

I should define the Block System as being, in addition to what is implied in the above definition, one in which there are certain permanent Signals which indicate the condition of the Line between any two stations with regard to its being either clear or Blocked by trains running upon it.

It differs from the "Line Clear" and Bell Systems by the fact that in the Block System, permanent visible signs, and the

Madras Railway Electric Telegraph Department

Probable increase in the cost of Maintenance of the Electric Telegraph consequent upon the introduction of the Block System

Particulars	Amount per mensem		
Workshop Expenses for repairs of Instruments &c	600	"	"
Half salary of an Asst Telegraph Engineer	242	"	"
Office Establishment	100	"	"
Extra Inspectors	210	"	"
Total Rupees	1142	"	"

(Signed) G. K. Winter
Tel. Engineer

(True Copies)

[signature]
Agent and Manager

P.W. 6017/74
Pg. 719 Oct/74
In B.N. 43 L.

4R 15

Report on the proposed introduction of either the Block or the Line Clear System on the Madras Railway.

1st Definitions.

It has been the custom recently among Telegraph Engineers to define the Block System as that System by which trains are kept apart, upon the same Line of Rails, by certain and invariable intervals of space, instead of by uncertain and variable intervals of time; in this way it is made to include all methods by which this space system can be carried out. Thus, according to the definition, not only the "Line Clear" System (or the System of asking the question in the "Line Clear" and getting an answer in the affirmative before allowing a train to start,) but also the Tel. and the Staff Systems are included. Now I do not hold to any such definition, nor do I think it is generally so understood amongst Railway men.

I should define the Block System as being, in addition to what is implied in the above definition, one in which there are certain permanent Signals which indicate the condition of the Line between any two stations with regard to its being either Clear or Blocked by trains running upon it.

It differs from the "Line Clear" and Bell Systems by the fact that in the Block System, permanent visible signs and the

memory of the Employes; and in some instruments prevent their being able to give a signal having the meaning of "Line Clear" unless the Line is actually clear at the time.

2. The abolition of the present system of working by Time table and crossing orders not necessary or desirable:

I have always been very anxious that this should be understood, and I have not only pointed it out in many conversations, but it has been explained in my letters on the subject. Knowing the class of men we have to deal with, and how much trouble I have had with them during my nine years experience in this country, I should decidedly say that to substitute the Block System for the present system would be attended with danger, and would certainly result in delays. In order that the Traffic on a Single Line should be carried out with the best possible efficiency, a great amount of intelligence is necessary in altering Meeting Stations; it is a well known fact that if altering Meeting Stations be injudiciously carried out more delay is caused than that which such alterations are intended to remedy. A knowledge of the running and position of other trains than those immediately concerned, as well as of the distance, gradients &c. between the different stations is necessary, and these things of course would not be known to the Block Signallers.

In our present system the whole conduct of the Traffic is in the hands of men

who have by long experience and education been well qualified to undertake this arduous and important duty. They are intimately acquainted with the section of the Line under their charge, and are kept continually informed of the position and running of all the Trains on their length, as well as of any unusual detention of Trains on adjoining divisions. The Time table is, as a rule, adhered to, and if any alteration is rendered necessary by the detention of a Train, the alteration of the ordinary meeting stations rests solely in the hands of men best fitted for making such arrangements. Special Trains, except in very rare cases, are now run under a special Time table, and hence form part of the general System, and are as much under the control of the District Traffic Managers as are the ordinary Trains. This system if supplemented by the Block would be all that could be desired. Under the present system the station Master before he starts a Train has reason to believe that the Line between his station and next, is clear, and, if no mistake has been made it must of course be so, but if the Block System were introduced as an auxiliary the Station Master, instead of having reason to believe that the Line was clear, would have means to ascertain that it was so. There is a in the Railway Act that no Train sh started from one station until it has been ascertained by Telegraph that the Line is clear to the next station; under the Block System as an auxiliary this could be ascer-

should attend to the Telegraph and to the Block Instruments, and to no other duty that would take them out of the signal room. This would be attended with expense of course, but the extra facility of carrying on the ordinary work of the Company, and the lessening to a considerable extent of the present waste of time, patience and the utility of the Telegraph in simply calling stations that would result, should I think be well considered. But although it would be very desirable to have special signallers at all stations, I think that an exaggerated idea has been formed as to the number absolutely required in order to carry out the Block System; in fact I see no more reason why the Station Master should not attend to the Block instruments himself, than there is against the present plan wherein he is his own signaller: As it is unless he is within call of the instrument, meeting stations cannot be altered. It would not be too much I think to expect him to be at the station at the times Trains are due at the stations on either side of him. At all events an assistant to the present station master, in cases where the station master at present does all the work, would in my opinion, fully suffice to enable the Block System to be carried out. There has been a rule that when a Station Master is forced to be absent from the signal office he should leave there a peon, able to recognise the call of his station. Now very few peons have been able to do this, and the rule has become a dead letter, but in the Block system there

no call signal, and the peon would only have to watch for the movement of the needle, or ringing of the Bell &c. according to the system employed. No danger could result, but only a chance of delay. But I would certainly advise the locking up of all keys connected with the Block Instruments during the absence of responsible people. If Native assistants be employed I do not think special accommodation for them would be necessary in the majority of cases. Certain hours should be laid down, during which either the Station Master or his assistant should be on duty, and at all other times a peon should be on duty to watch for signals and to give warning should they come.

B. Delay to Trains travelling in the same direction.

In dealing with this question we must understand that there are two distinct kinds of Block System.

1st There is that which on a Double Line prevents Trains from following too quickly after each other, this is called a non-following Block System.

2d There is a non-meeting Block System, which prevents the use of a given section of single line by more than one train at a time.

I have been for sometime working at the improvement of this second system. What I am trying to do

tained in the most reliable way possible.

3. Advantages of the Block System as an auxiliary.

We have not had many collisions but we have had two, and we very nearly have had several more. I need not point out that the collisions we have had would have been avoided, and the risk of having the others would never have occurred had the Block System been in use. Any mistakes or oversights that may be made would, under this system, be immediately found out, and accidents, that would otherwise arise from them, would be avoided. Also, and this is a most important point, those [illegible] the responsibility of altering the meeting stations rests would be relieved, to a certain extent, from that feeling of the awful consequences that would, under present circumstances, result should any oversight be made by themselves or their subordinates; and while on this subject I would point out that lately we have had several cases of false Telegrams sent, and messages received by stations other than those for which they were intended. If any of these cases should occur with regard to the altering of meeting stations a collision would be inevitable. In the Block System a [illegible] master is always certain that it is [illegible] next station he is speaking to and hence there is no such danger to be feared.

It might be said that it would be unwise in any way to lessen the feeling of responsibility in those charged with the alteration

of meeting stations. This is true, but it is not what I mean by relieving them to a certain extent of the feeling of the awful consequences of an oversight. The responsibility they must have, but the dread of the consequences of an error or oversight is a different thing. It cannot fail to have a prejudicial effect on the mind, and is more likely itself to cause, than to prevent a catastrophe.

Another important point is that Ballast and special Trains could be worked much more safely and easily than at present.

4. Disadvantages of the Block System as an auxiliary.

A. Expense. The chief part of the cost of applying the system would be the extra signallers that would have to be employed.

I have always urged that our present system of making the station Masters do the duty of signallers in addition to their other duties is very unsatisfactory, and I believe that the Madras Railway Company is the only large Indian Railway Company in which such an arrangement obtains. It is a notorious fact that most stations are most difficult to obtain except when a train is due, and the difficulty the assistant Traffic Managers find in altering the meeting stations from this cause is best known to themselves. I say that each station should have its signallers, as on all other large Railways, and that these signallers

should attend to the Telegraph and to the Block Instruments, and to no other duty that would take them out of the signal room. This would be attended with expense of course, but the extra facility of carrying on the ordinary work of the Company, and the lessening to a considerable extent of the present waste of time, patience and the utility of the Telegraph in simply calling stations that would result, should I think be well considered. But although it would be very desirable to have special signallers at all stations, I think that an exaggerated idea has been formed as to the number absolutely required in order to carry out the Block System; in fact I see no more reason why the station master should not attend to the Block instruments himself, than there is against the present plan wherein he is his own signaller: As it is unless he is within call of the instrument, meeting stations cannot be altered. It would not be too much I think to expect him to be at the station at the times Trains are due at the stations on either side of him. At all events an assistant to the present station master, in cases where the station master at present does all the work, would in my opinion, fully suffice to enable the Block System to be carried out. There has been a rule that when a station master is forced to be absent from the signal office he should leave there a peon, able to recognise the call of his station. Now very few peons have been able to do this, and the rule has become a dead letter, but in the Block system there

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2d There is a non-meeting Block System, which prevents the use of a given section of single Line by more than one train at a time.

I have been for sometime working at the improvement of this second system. What I am trying to do

is to get an instrument which will allow two or three Trains to follow each other and indicate how many Trains are on the Line travelling in the same direction, each Train being unblocked as it arrives at the next station. There would of course be no more danger in allowing Trains to follow each other then than there is now, and I do not think any non following Block is wanted with our limited Traffic.

C. Carelessness of employés endangered by the feeling of security arising from the application of the Block System.

Captain Tyler has so well expressed his views on this subject in his report on accidents

Accidents for 1872 that I cannot do better than quote an extract from that report.

"It is a favourite argument with those who oppose the introduction of some of these improvements, or who make excuses for the want of them, that their servants are apt to become more careless in the use of them, in consequence of the extra security which they are believed to afford, and it is desirable to consider seriously how much of truth there is in the assertion. There may no doubt be a tendency some times on the part of Engine Drivers who are working under a Block-system to consider that the Line is certain to be clear of Trains ahead of them, and not therefore to keep so good a look out between the signal cabins.

The Guards and Breaksmen, also, under similar circumstances, do not see, naturally the same necessity for running back to warn following Trains in the event of an unusual stoppage, when they are working under the protection of the Block system, as when they are aware that safety depends on their unaided exertions.

In order to counteract these tendencies on the part of servants stricter discipline is required; and it should be remembered that the Block system is not intended to supersede the use of

signals, or to obviate the necessity for exceptional protection in cases of unusual stoppage.

But, making the most of these tendencies to confide too much in additional means of safety, the risk is proved by experience to be incomparably greater without them than with them; and in fact, the negligence or mistakes of servants is found to occur most frequently, and with the most serious results, not when the men are over confident in their appliances or apparatus, but when, in the absence of them, they are habituated to risk in the conduct of the Traffic.

The more they are accustomed to incur risk in order to carry on their business, the less they think of it, and the more difficult it is to enforce discipline and obedience to regulations - The personal risk which is encountered by certain class of Railway servants, has never yet been precisely ascertained; but it is, as shown by the proportionate number of casualties, very great, and it is difficul under any circumstances, to prevent men who are in constant danger themselves from doing things which may be a source of danger to others, or at all events from strictly obeying regulations for which they do not see altogether the necessity and which impede them in their work."

5th

Line clear system

Definitions

As I understand the Regulation in para 2 of section I made in conformity with section 29 of Act 18 of 1854 the Line clear system is as follows.

"No Engine, with or without a Train, shall be permitted to leave one station for another, until it shall have been ascertained, by means of the Electric Telegraph, that the Line between those two stations is clear of Engines and Trains, and of all impediments, so far as can be known."

According to Col. Dicken's letter No 1691, para 8. it appears that although it was originally intended that the Line should not be considered clear unless it was clear of all Engines or Trains travelling in either direction, it has been generally held that the Line is to be considered clear for a following Train, if a sufficient interval of time has elapsed since the departure of the last Train travelling in the same direction between the two stations, even though it may not have arrived at the next station.

6th

The Line clear system wrong in principle

C and D are two stations on a single Line of Railway - C wishes to start a Train towards D, and is required by the Line clear system to find out from D whether the Line is clear, a question, ~~a question~~ he is much better able himself to answer than D is, for he must know better than D,

whether the last Train travelling towards C, for which D had asked and C had given "Line clear", had arrived at C; and again he must know best himself, whether a sufficient interval has elapsed since he sent the last Train towards D.

7th The Line clear system dangerous in practice.

When a system is wrong thus in principle, it is only to be expected that it should lead to mistakes - To give an example; D asks C, Is Line clear. C answers yes, and a Train starts - The Train is delayed on the road, and C some time after, forgetting that a Train was coming, asks D, Is Line clear? D thinking that C would not have asked the question unless the previous Train had arrived, answers yes, and C starts his Train in the teeth of the delayed Train from D. A Collision occurs, and who is to blame. Certainly in my opinion the system more than either of the signallers, and of the signallers C is more to blame than D, because C's act was one of forgetfulness whereas D had no means of knowing whether the Line was clear or not -

The Line clear system as usually carried out has another great danger, namely that a man, when he calls the next station, is never sure that it is the next station who is answering him.

This could be remedied by having the Block only from station to station, but this would involve an additional wire, and in that case, why not have the Block system at once, and save all chance of forgetfulness on the part of the Employés.

The proper Line clear system.

8th If however, for the sake of Economy, it should be determined not to have the Block system, which I have already shown should be only an auxiliary, but that the Line clear system should be used as an auxiliary; then, when a man at C wants to start a Train towards D, he should call D, and state his intention to do so, and ask D to let him know when it arrives - Of course this might be done in Code - A Train register book should be kept open by the side of the instrument, giving, in a proper tabulated form, the Times at which all such communications take place, so that there would be some aid to the memory - This would no doubt be some check, and would, as an auxiliary be of some value, but it would never do to make it the sole method of working the Traffic.

9th Conclusion.

To sum up, I think it cannot be denied that our present system of Conducting the Traffic on long lengths of Single Line by means of a Time Table and crossing orders, is the best

that could be devised - It is, I believe, in use on the Great American Lines, which are far more analogous to our own than any of the English Lines. At the same time great advantage would result from the introduction of the Block system as an auxiliary - It could not possibly clash with our present system, unless some mistake had been made; and in that case this very clashing would lead to the discovery of the mistake, and prevent the accident that would otherwise arise.

(Signed) G. H. Winter
Telegraph Engineer

M. R. Tel. Engr's Office
Bangalore
7th April 1874.

(True Copy)

[illegible]
Agent & Manager

Proceedings of the Madras Government

Read the following:-

[illegible] the Jong Engineer

[illegible] "time-tell" [illegible]

[illegible] used, but the "time-tell" system ~~[illegible]~~ [illegible] in the opinion of the Madras Govt. [illegible]

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P. W. 6017/74
2
P.G. 19 Oct/74
In B.A. 4.34

Agent & Manager

Eng.

Pt. 5982

P.W.C.

Proceedings of the Madras Government

Read the following:-

From the Jong Engineer for Rys: } (H. E. No. 565 of 24th Sept. 1874)

2981

Communicated for orders of the Govt. of India with remark that the principle on which the Madras Railway is worked appears not to have been clearly understood; the "line clear" system never having been in use, but the "time-table" system ~~and with [illegible]~~ success (in the opinion of the Madras Govt. with [illegible] success)

[illegible] 20.5

3/10

[illegible]

1/10

[illegible] (in the opinion [illegible] the Madras [illegible] with [illegible]) the "time-table" system

though he doubt ad-
-ditional security
would be gained from
supplementing it by
the Block system, if
it could be afforded.

G.W.

2982

434-436.

Rec 30/9/74. Rd 5/10/74

To
The Consul Engineer
for Rys.

S. Copies desp^d 26/10/74.

30 S. Copies desp^d 26/10/74.

X

of the Iranis -

6017

Govt. of 1874 Madras.

PUBLIC WORKS.

To

The Con: Engr for Rys

Secy to govt of India

Dated

Recd. Encl 4

2981

G. O. R Act 1874. No. 2982

Nos 434-436:

Working of Trains

Letter from the Cong Engr for Railways submitting ~~papers~~ papers from the Agent Madras Ry Co. re-porting on the subject of intro-ducing "Block" system for the working of the trains, conducted the Govt of India with certain remarks—

Forwarding for orders letter from the Cong Engr for Rys submitting papers from the Agent of the Madras Ry Co reporting on the subject of introducing [illegible] system for the working

Cons 30/9/74 Rd 5/10/74