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MADRAS RECORD OFFICE.

Government of Madras.

Public DEPARTMENT.

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Not to be folded or roughly handled

Proceedings of the Madras Government, Public Works Department, 29th July 1871.

No. 499. Read the following Proceedings of the Government of India, Public Works Department, (Railway,) dated Simla, 4th July 1871, Nos. 1,143—53-R.:—

Measures for the prevention of accidents to trains while passing through points and crossings.

READ—

Despatch from the Government of Bombay, to the Secretary of State, No. 18, dated 14th May 1870.

To the Secretary, Public Works Department, India Office, No. 1,941-R., dated 6th December 1870.

From do. do. do., dated 31st January 1871, and enclosure.

Despatch from the Secretary of State, to the Government of Bombay, No. 4, dated 9th March 1871, and enclosures.

To the Government of the Punjab, No. 612-R., dated 1st April 1871, and enclosure.

From do. do., No. 1,460-G., dated 17th April 1871.

ORDER.—Ordered that a selection* from this correspondence, with drawings, be forwarded to the Governments and Administrations noted in the margin.

(Signed) A. H. VAUX.
Under Secy. to the Govt. of India.

* Despatch from Bombay, to Secretary of State, No. 18, dated 14th May 1870.
Mr. Harrison's letter to the Under-Secretary of State, dated 28th January 1871.
Despatch, No. 4 of 9th March 1871, from Secretary of State to Government of India, with enclosures.

Madras.	Oudh.
Bombay.	Central Provinces.
Bengal.	Mysore.
North-Western Provinces.	Hyderabad.
Punjab.	Central India.
	Burmah.

From the Government of Bombay, to the Secretary of State for India, dated Bombay Castle, the 14th May 1870, No. 18.

WE beg to draw your attention to the large number of accidents that occur in this country from pointsmen letting go points when a train is on, or near them, or from their intentionally changing the position of the points while a train is passing through. We are strongly of opinion that the points ordinarily used on the lines in this Presidency should be so far modified as to make it impossible for a pointsman to shift the points when the train was either on or within a certain limited distance, say thirty feet of the points. We believe there are several descriptions of points in use in England by which this object can be attained, and we should be obliged, if your Grace would make enquiries, through the Consulting Engineers of the different Indian Railway lines, with a view to have some cheap modification of the points already in use on the lines out here introduced into this country.

From T. E. HARRISON, Esq., to the Under-Secretary of State for India, dated Westminster Chambers, Victoria Street, S. W., the 28th January 1871, No. 1.

I HAVE the pleasure of sending with this plan of the system I have adopted on the North Eastern Railway of "wedging facing points."

The plans show two modes of working the wedges, both of which have been for some time in operation with complete success.

These points are always worked in connection with the Signal Docking Apparatus, and the opinion arrived at of their safety, by all the practical officers of the Company, namely, the Permanent Way and Locomotive Superintendents and particularly the Enginemen and Platelayers, is such that I have introduced facing points in many cases where for years we have back shunted the trains.

I shall be glad to give any personal explanation of the plans and mode of working should it be wished for.

From the Secretary of State for India, to the Government of Bombay, dated India Office, London, the 9th March 1871, No. 4-R.

With reference to your Excellency's despatch No. 18, dated 11th May last, relative to the adoption of some modified description of points on the Indian Railways, I transmit herewith copy of correspondence with the Directors of the Great Indian Peninsula, the Bombay, Baroda, and Central India, and the Sindh, Punjab, and Delhi Railway Companies, including reports by their Consulting Engineers, on the subject. It will be seen that with my sanction the Directors of the Great Indian Peninsula Railway Company are about to send out, for experimental use, two sets of Ransomes and Rapier's switches, with safety apparatus and signal post and fittings, and two sets of Saxby and Farmer's patent switch locking apparatus and two wrought-iron point indicators; also that the Directors of the Bombay, Baroda, and Central India Railway Company will, in like manner, send out a specimen set of Messrs. Easterbrook and Company's signals and points.

From T. R. WATT, Esq., Great Indian Peninsula Railway Company, to the Under-Secretary of State for India, dated No. 3, New Broad Street, London, E. C., the 17th February 1871, No. 30.

With reference to Mr. Grant Duff's letter of the 13th June last, relative to a suggested adoption of some modified description of points, such as may serve to prevent accidents from mismanagement of pointsmen, I am desired by the Board to forward herewith, for submission to His Grace the Secretary of State for India in Council, a report of the 2nd February instant upon the subject from Mr. Berkley, the Company's Consulting Engineer, and to request sanction to order two sets of switches, with safety apparatus and signal post and fittings, of Messrs. Ransomes and Rapier at a cost of 76*l.*, and also two sets of switches with "patent switch locking apparatus," and two "wrought-iron point indicators," from Messrs. Saxby and Farmer at a cost of 52*l.* 15*s.*, with a view to the trial of them in the manner recommended by Mr. Berkley.

2. As regards the other portion of Mr. Berkley's report, the Board propose to instruct the Company's Agent to carefully consider the several recommendations in communication with the Government, and to report fully thereon to the Board.

From G. BERKLEY, Esq., Consulting Engineer, Great Indian Peninsula Railway Company, to the Under-Secretary of State for India, dated Victoria Chambers, Westminster, the 2nd February 1871.

At the end of October 1870, you forwarded to me tenders, submitted by the manufacturers named in the margin, for "switches with point indicators and safety apparatus," with plans to represent that which each proposed to supply.

Messrs. Ransomes and Rapier.
" Saxby and Farmer.
" Stevens and Son.
" M'Kenzie, Clunes, and Co.
" Yardly and Co.

Among these plans I find that only two, namely, those sent by Messrs. Saxby and Farmer and by Messrs. Ransomes and Rapier, comply with the requirements of the specification.

In my letter of the 23rd September, I stated that safety apparatus had not yet been extensively applied. It has consequently, been a work occupying a considerable time to visit the parts of English and Scotch Railways where this apparatus has been in practical operation for a sufficient period to prove that it may be used without the introduction of greater risk of accident than that which it is designed to avoid.

The result of this personal examination has been to induce me to consider that the safety apparatus proposed to be supplied by Messrs. Ransomes and Rapier is the more perfect, while that of Messrs. Saxby and Farmer is less costly, and to think that both of them should be tried in India before either is selected for exclusive and general use.

With this view I beg to recommend that two sets of switches, with safety apparatus and signal post and fittings, be ordered of Messrs. Ramsomes and Rapier at a cost of 76*l.*, and also two sets of switches with "patent switch locking apparatus," and two "wrought-iron point indicators," be ordered from Messrs. Saxby and Farmer, at a cost of 52*l.* 15*s.*

I also recommend that each of these "two sets" be fixed immediately on their arrival in India at one of the passing stations, and that the Chief Engineer be requested to take an early opportunity of reporting which is found the most suitable, and his opinion of each having reference to the extra cost of that of Messrs. Ransomes and Rapier, or rather of Mr. Brunton, the late Engineer of the Sindh Railway, who is the designer of the apparatus proposed by this firm.

At the same time that I submit to the Board of Directors this recommendation, I feel it to be my duty to direct attention to the desirability of the adoption of the more perfect system of signals and points, worked at each important junction and station by means of locking apparatus, which has for many years been introduced with satisfactory results on English Railways, and which is now regarded by many as necessary to insure a proper degree of freedom from risk or accident.

I have on more than one occasion, within the last few years, written to some of the heads of departments in India, drawing attention to this admirable system, and have informed them that, when they desired to introduce it, a plan of the particular junction or station where its use was proposed must be sent to England with the indent.

I now add, as a supplement to this report, descriptions with plans and estimates of arrangements proposed by Messrs. Saxby and Farmer and Messrs. Ransomes and Rapier, at my suggestion, for the working of points and signals at passing places in a satisfactory manner, in order that these may receive early and careful consideration from your General Traffic Manager, your Chief Engineer, and your Agent, who will doubtless also refer them, with their own views thereon, to the Consulting Engineer to Government.

I cannot conclude this report without expressing my opinion that the introduction of some arrangement, like those proposed at the passing station, of interlocking apparatus at the principal junctions and stations, and of the block telegraph system along your railway referred to in my letter of the 15th November 1869, deserve and demand the early and serious consideration of the heads of departments in India.

Messrs. Saxby and Farmer's Plans.

We will now proceed to explain the systems we suggest, first, however, premising that they are equally available and safe for any mode of working the traffic.

At passing stations where there are two platforms, it is usual for trains approaching the station in either direction to keep invariably to the left-hand platform, the doubled lines within the station being used as distinct "up" and "down" lines inviolably.

The illustration of your passing stations on the printed specification shows a platform only on one side of the railway; and, therefore, if the above rule were adopted, passengers in one direction would never have the advantage of a platform at all.

We assume, therefore, that, in practice, your trains will be allowed to enter the platform siding or loop at either end to take up and set down passengers, whilst goods or other trains not requiring to stop at the platform may pass on the straight road in either direction.

In the case of platforms on both sides of the railway, the normal position of the points at each end of the station would be right for the left-hand road; but, in the case of a platform only on one side of the railway, to be used for traffic in both directions, the points at both ends of the station should, in their normal position, lay "right for the through road." This, however, is a matter of regulation."

PLAN No. 1.

This apparatus consists of only two levers, and yet combines all the advantages of interlocking points and signals, and renders the duties of the signalman as simple as possible.

The semaphore arms are at once the station signals "in" and "out" of either line, as well as the indicators of the position of the points.

The points are worked by one lever, the large one, and the semaphore arms by the second or smaller lever.

The semaphore arms, as seen by approaching engine-drivers, apply as follows :—

That on the left side of the post to the left-hand line, and that on the right side of the post to the right-hand line.

Both arms can be held up together by the single lever to indicate the "stop" or danger signal against both lines when necessary, and, in that respect, fulfilling the functions of a station signal, as distinguished from the ordinary indicator, which is necessarily always indicating one or other of the lines clear, and is incapable of giving a positive signal to "stop" both lines.

The signal lever is only capable of giving one signal at once, and only that one corresponding with the position of the points; and, except the points are properly set in either direction close home to the stock rail, no signal for passage can be given.

The signal lever is made to actuate the coloured glasses for the night signals in the same manner, but one lamp is made to give all the indications.

In this arrangement we show the application of our improved "facing point lock," combining the switch lock, with a bolt or wedge.

This combined switch lock and bolt is connected to, and worked by, the signal lever, and is only put into action when either signal arm is lowered.

When both the signal arms are up, the "switch and bolt lock" are out of gear, and have no effect on the points.

This is important, as, in the event of an engine improperly forcing through the points "trailing," the switch and bolt lock would be out of harm's way, and would not be broken.

The objects secured in this plan, and by only two levers, are—

1*st*.—It is mechanically impossible that the signalman can make the mistake of displaying conflicting signals, or of setting switches in positions contrary to the indication of the signals.

2*nd*.—The points must be properly set, close home to the stock rail, or the signal for a train to pass cannot possibly be given, and the least obstruction occurring to prevent the full and true opening or closing of the points is at once discovered, even with connecting rods of the greatest length practicable.

3*rd*.—The points are wedged firmly and immovably in the position indicated by the signal, and the ordinary jolting and jarring occasioned by passing trains is avoided.

4*th*.—Whilst a train is actually travelling through the points, it is itself master of the situation, not even the signalman can, either intentionally or inadvertently, change their position or disturb them until the whole train is safely passed.

PLAN No. 2.

In plan No. 1 it is understood that the signals and switches appertaining to one end of the station are worked independently of those at the other end of the station.

In this plan (No. 2) it is arranged to concentrate the working of the points and signals appertaining to each end of the station at one central position, all to be worked by one man.

A saving of labour and of divided responsibility in the signalmen would be effected by it, and we are satisfied it would work perfectly well.

In our arrangement for this concentration we take advantage of the special design we have made in plan No. 1, and by it are enabled to make an apparatus of only four levers do the whole of the work, and with all the advantages and security stipulated in plan No. 1.

This four-lever apparatus might be fixed about the centre of the station, and would not necessarily require to be boxed in.

Proceedings of the Madras Government, Public Works Department,
29th July 1871.

In this plan we have shown a somewhat different arrangement of the signals. At each end of the station we propose a signal-post, with upper and lower arms upon it, the upper signal indicating to arriving trains the straight road, and the lower signal the platform loop, and taking advantage of the concentration of the levers, we should interlock them so that trains arriving from opposite directions would not both be simultaneously signalled to enter the station.

The existing station signals may be made to answer by having an additional arm fixed upon them.

In this arrangement we think it is desirable to have point indicators attached to the points, to show their proper working to the signalman, who will be about 200 yards away from them, and also to indicate to engine-drivers, when passing out of the station, that the points are set right for them "trailing."

Our patent lever-locking apparatus is in practical operation on nearly all the railways in the kingdom; and the latest improvements in "switch lock" or "facing point" apparatus may be seen in practical operation at Kensington Station, West London Railway, or at the Bricklayer's Arms Station on the Brighton Railway. And we beg to notify that our prices include royalties both in respect of our English and Indian patent.

(Signed) SAXBY AND FARMER.

Estimate of Plan No. 1.

Cost of one station complete.

(Delivered at London or Liverpool.)

	£.	s.	d.
Two sets of steel switches, with chairs, etc., complete, at 13*l*. 10*s*.	27	0	0
Two patent lever-locking apparatus, 2 levers each, namely, 4 levers, at 8*l*.	32	0	0
Two improved patent combined switch and bolt locks, at 6*l*. 12*s*. 6*d*.	13	5	0
Two wrought-iron double arm semaphore signals, with special spectacles arrangement, constructed for both arms to operate on one and the same lamp, 17 feet high, with ladders and all fittings complete, each 15*l*. 10*s*. ...	31	0	0
Four sets of patent slot arrangement for enabling both arms to be actuated by one signal lever and governed by the point lever, so that the signal displayed must always be in unison with the position of the points, at 8*l*.	32	0	0
Four cranks in pedestal, for connecting to signal and switch lock, 15*s*.	3	0	0
Forty yards rod connexions to switch locks, points and signals, at 2*s*. 6*d*.	5	0	0
	143	5	0

(Signed) SAXBY AND FARMER.

Plan No. 1.

Schedule of Prices.

(Delivered at London or Liverpool.)

	£	s.	d.
Steel switches, with chairs, etc., complete, per set... ...	13	10	0
Patent lever-locking apparatus, per lever	8	0	0
Improved patent combined switch and bolt lock, each ...	6	12	6

	£.	s.	d.
Wrought-iron double-arm semaphore, with special spectacle arrangement, constructed for both arms to operate upon one and the same lamp, 17 feet high, with ladder and all fittings complete, each	15	10	0
Patent slot arrangement, for enabling both arms to be actuated by one signal lever, and governed and locked by the point lever, so that the signal displayed must always be in unison with the position of the points, per set	8	0	0
Wrought-iron cranks for connecting switch lock, each ...	0	10	0
Pedestals for do.	0	5	0
Rod connexions to switch locks and signals, per yard... ...	0	2	6

(Signed) SAXBY AND FARMER.

Estimate of Plan No. 2.

Cost of one station complete.

(Delivered at London or Liverpool.)	£.	s.	d.
Two sets of steel switches, with chairs, etc., complete, 13*l.* 10*s*	27	0	0
One patent lever-locking apparatus, 4 levers, 8*l*	32	0	0
Two improved patent combined switch and bolt locks, 6*l.* 12*s.* 6*d.*	13	5	0
Two wrought-iron double-arm semaphores, with 2 arms, 2 lamps, spectacles, ladders, and all fittings complete, as per drawing, 25 feet high, each 18*l.*	36	0	0
Four sets of patent slot arrangements, for enabling both arms to be actuated by one signal lever, and governed and locked by the point lever, so that the signal displayed must be in unison with the position of the points, 8*l.* ...	32	0	0
Twelve cranks in pedestals, for connecting points, switch lock, and signal, 15*s.*	9	0	0
Four compensating levers, 10*s.*...	2	0	0
Four pedestals for do , 5*s.*	1	0	0
Four adjusting screws, 7*s.* 6*d.*	1	10	0
850 yards rod connexions to points, switch locks, and signals, 2*s.* 6*d.*...	106	5	0
	269	0	0

(Signed) SAXBY AND FARMER.

Plan No. 2.

Schedule of Prices.

(Delivered at London or Liverpool.)

	£	s.	d.
Steel switches, with chairs, etc., complete, per set ...	13	10	0
Patent lever-locking apparatus, per lever	8	0	0
Improved patent combined switch and bolt lock, each ...	6	12	6
Wrought-iron double arm semaphore, with 2 arms, 2 lamps, spectacles, ladders, and all fittings complete, as per drawing, 25 feet high, each...	18	0	0
Patent slot arrangement for enabling both arms to be actuated by one signal lever, and governed and locked by the point lever, so that the signal displayed must be in unison with the position of the points, per set	8	0	0

	£	s.	d.
Wrought-iron cranks for connecting points, signals, and switch locks, each	0	10	0
Pedestals for do.	0	5	0
Compensating levers	0	10	0
Pedastals for do.	0	5	0
Adjusting screws	0	7	0
Rod connexions to switch locks, signals and points, per yard...	0	2	6

(Signed) SAXBY AND FARMER.

Messrs. Ransomes and Rapier's Plan.

In plan No. 1, the switches at each end of the passing place are coupled to the platform apparatus, so that, if the switches at one end of passing place are open for the main line, the switches at the other end are simultaneously set open for the loop, thus rendering any collision of two meeting trains impossible.

Fig. 1.—The pointsman is able to bring either train to the platform side of the station, as he may be directed by the Station Master.

Fig. 2.—The Station Master also has the power (by means of a key which he alone keeps) to pass a special or non-stopping train through the station with perfect safety.

The existing distant signals can be coupled to this apparatus in such a way that the safety signal can only be given when the switches are *perfectly* set, and, after the safety signal has been given, the switches cannot be altered.

The switches are made of the best Bessemer steel rails, and are fitted with locking apparatus in such a way as to secure—

(1.) That the points shall always be brought close home, and locked in such a way that they, cannot be jerked open by the passing train.

(2.) That the points cannot be moved by a pointsman after a train has once entered them until the last vehicle has passed over.

(3.) The dangerous practice of the points having to be held open by the pointsman during the passing of train is entirely abolished.

(4.) An indicator shows the driver which road the switches are set for, a fact most important he should know.

(5.) The same indicator shows the driver a danger or stop signal if the points are imperfectly set.

(6.) Additional security is gained by the circumstance that, if there is anything wrong with the points, the driver is warned by the distance signal continuing at danger.

Thus an accident can only happen by the pointsman misplacing the points, and the driver at the same time running contrary to signal.

A further advantage of the arrangements is, that, instead of having a pointsman at every pair of points, as at present, the apparatus can be worked by one man, and, as it is fixed on the platform, it can be worked by a policeman, ticket collector, or other functionary, who performs other duties at other times.

The saving in working expenses effected by this arrangement would be the wages of four or five pointsmen, even at a small station, and this, besides being a saving of wages, is also a saving of blunders and their costly consequences, which are always greatly multiplied when the number of agents is greater.

Promptitude of action and the immediate control of the Station Master are secured by this arrangement, and these are features of the greatest value in the working of a station.

Fig. 3.—The handles which move the signals and switches are so arranged that the signal handles stand perpendicular when the signals are at danger or up, and at an angle of 45° when the signals are at safety or down, and thus the Station Master constantly sees, instinctively or

the siding, as most erroneously required by every train that stops at any stations on our line, I would observe that—

In the first place, this most fertile of all the sources that produce accidents on railways might be vastly reduced on our line by merely rescinding the objectionable Government rule, as I have, on former occasions, frequently suggested, and only requiring a train to enter a siding when it has to cross another train going in the opposite direction. If we have three through-trains running in each direction daily, and that every train *must* bring up at each of our 51 stations, we must now encounter the risk and cost due to passing through 102 sets of points and crossings with each train on each through journey, instead of passing through only six sets, or, for a whole day's working, 612 of these processes are forced upon us, whilst 36 should suffice.

Would it not be well once more earnestly to implore relief from the 576 unnecessary risk to which our goods, passengers, and machinery are thus daily and wantonly exposed by the effect of a mischievous Governmnet rule, a rule, too, which, if I am rightly informed, has been suspended for the benefit of more favoured Companies than ours, or when the Government Supervising Department possess higher qualities for the exercise of their most important functions.

Assuming that the power of the Government may be thus enabled to reduce this class of risks to one-seventeenth of the present amount, we have only to adapt the best existing appliances to what shall remain. The best precaution for security in passing through points and crossing would be found in the adoption of Easterbrook's patent locking apparatus for signals and points, of which the cost is estimated at 33*l.* 8*s.* for the simplest class of stations, with a relative increase for the more complicated stations. There is little doubt that to apply this principle to the whole of our 51 stations would cost over 2,000*l.*

A very simple contrivance, namely, bolting the existing levers to a quadrant whilst the train is passing through the points, might be applied, as shown in accompanying sketch No. 2, at a cost of about 4*l* per station. But this would be very inferior in security to Easterbrook's system, of which latter I would advise that one specimen sample set be sent to India at the specified cost of 33*l.* 8*s.*

From the Under-Secretary of State for India, to the Secretary, London Board, Bombay, Baroda, and Central India Railway Company, dated India Office, London, the 2nd March 1871.

With reference to your letter of the 7th October last, No. 1,058, I am directed to acquaint you that the Secretary of State for India authorizes the provision for experimental use in India of a set of Mr. Easterbrook's apparatus for locking signals and points.

I am to add that a copy of Colonel Kennedy's report received with your letter will be transmitted to the Government of Bombay.

From the Chairman of the Sindh, Punjab, and Delhi Railway Company, to the Under-Secretary of State for India, dated London, E. C., the 4th February 1871, No. 101.

With reference to Mr. Grant Duff's letter of the 13th June last, transmitting copy of a despatch from the Government of Bombay, suggesting the adoption of some modified description of points on Railways in India, such as may serve to prevent accidents from the mismanagement of pointsmen etc., and requesting that the matter might receive the consideration of this Board in communication with their Consulting Engineer, I have now the honour to state that Mr. Bidder has given the question his most earnest attention, and I enclose copies of two letters from him dated 24th October 1870 and 13th January 1871, respectively, on this subject, which I request you will do me the favour to submit for the information of the Secretary of State for India in Council.

It will be observed that Mr. Bidder proposes, in a further report, to show the extent and cost of protecting the stations on the lines of the Sindh, Punjab, and Delhi Railways by the most approved description of facing points, and I will, on receipt of his views, address a further communication to you.

Proceedings of the Madras Government, Public Works Department, 29th July 1871.

without any effort of thinking, which way the switches and signals are set, and he has thus a perfect check on the pointsman.

Estimate of cost of Mr. Brunton's apparatus for passing places on Plan No. I. Messrs. Ramsome and Rapier's Plan.

	£
Two sets switches (steel) fitted with locks and indicators complete ...	80
One platform apparatus	30
Lay 400 yards of rods fitted with roller guides, all made to gauges ...	80
Eight bell cranks, expansion levers, etc., with knuckles, bolts, and pedestals	16
Total...	206

The above would save the wages of two pointsmen by day and two by night.

From M. E. GRANT DUFF, Esq., M. P., Under-Secretary of State for India, to T. R. WATT, Esq., Great Indian Peninsula Railway Company, dated India Office, London, the 2nd March 1871.

I am directed by the Duke of Argyll to acknowledge receipt of your letter of the 17th ultimo, No. 30, and to acquaint you, in reply, that he sanctions the provision, for experimental use in India, of two sets of each of Ransomes and Rapier's and Saxby and Farmer's locking apparatus, etc., as therein proposed.

I am to add that a copy of Mr. Berkley's report, received with your letter under reply, will be transmitted to the Government of Bombay.

From the Secretary of the Bombay, Baroda, and Central India Railway Company, to the Under-Secretary of State for India, dated 45, Finsbury Circus, London, E. C., the 7th October 1870, No. 1,058.

In further reply to Mr. Grant Duff's letter of the 13th June last, as to the modification of the points in use on the Indian Railways, as suggested by the Bombay Government, I am now desired to enclose a report on this subject from Colonel J. P. Kennedy, this Company's Consulting Engineer, No. 1,783, under date of the 1st July last, for the consideration of His Grace the Secretary of State.

2. In this report Colonel Kennedy strongly deprecates the present Government rule, under which all trains have to leave the existing main line at all stations and take the sidings, thus passing through two sets of points, whereas this is only really necessary at those stations where trains cross each other. This rule, in practice, no doubt increases the wear and tear both of the rolling stock and permanent way, and it is understood that it has been modified on some of the other Indian lines, the Madras Railway for example.

3. With respect to the best system of locking the points, Colonel Kennedy recommends that of Messrs. Easterbrook and Company for signals and points, the cost of which for the simplest class of station, he estimates at 33*l.* 8*s.* with a relative increase for the more complicated stations. Before, however, applying this or any system generally throughout the line (which would probably cost over 2,000*l.*), he recommends that one specimen set be sent out for trial in India, and the Board would be glad to receive the sanction of the Secretary of State to this being done.

From Colonel J. P. KENNEDY, Consulting Engineer of the Bombay, Baroda, and Central India Railway, to the Secretary to the Bombay, Baroda, and Central India Railway Company, dated Finsbury Circus, London, E. C., 1st July 1870, No. 1,783.

Referring to the Agent's letter No. 2,384 of 1870, with its accompaniments, suggesting the consideration of some contrivance whereby the *Native* pointsmen might be able, with less effort, to hold the points securely in the required position while a train is passing through to bring up on

In this arrangement the switches are moved by means of cams and eccentric block pieces, whic are fixed on a rocking spindle carried in an iron frame which is laid under and across the line of rails.

The cam C moves the sliding bar which connects the two switch tongues, by working between the studs *(ff)* carrying friction rollers, as shown, and the locking is effected by the lock pieces LL which turn up during a portion of a revolution of the spindle, between the closed tongue and main frame, and between the completely opened tongue and adjacent rail, respectively, and thus secure them in a proper position, without the possibility of accidental displacement.

In addition to this, the blocks L L have also a projection *(t)* extending beneath the tongue rail, and so shaped that, when the rocking spindle commences its movement, the part *(t)* lifts the tongue rail before the traversing movement of the switch begins; and if a vehicle is on the switch tongue, the pointsmen is unable to lift the tongue rail, and cannot proceed to effect the traversing movement.

On the rocking spindle there is also a contrivance for working an indicating arrow, which shows to the driver for which road the switches are set, provided they are perfectly set and locked, but indicating danger so long as they are imperfectly set, or even if unlocked.

In ordinary cases in England, as proved on the South-Western Railway, this apparatus can be properly and easily worked by a hand lever, as shown on the drawing, but for India, it will be advantageous to substitute a hand wheel, making three or four turns through suitable gearing to effect the necessary motion. This will obviate any difficulty arising from the inferior physical strength of the Native pointsmen, and by occupying somewhat more time to diminish the dangers resulting from panic or want of nerve.

I have already had occasion to notice incidentally, as an objection to some of the foregoing plans, the number and complexity of the fixed and moving parts, and beg to subjoin, in a tabular form, some of these facts in reference to the inventions which have been brought under your notice:—

Number on tracing or drawing.	—	Total Number of parts.	Number of moving parts.	Number of fixed parts.	Number of supports for fixings.	Number of handles.
...	Old padlock plan	2	2	...	...	...
1	Livesey and Edwards	42	27	15	7	1
2	Brady	58	28	30	7	1
3	Livesey and Edwards's improved	85	37	48	12	2
4	Price Williams...	119	66	53	19	1
5	T. E. Harrison...	124	35	89	6	...
6	Brunton and Rapier	34	9	25	1	1

Now, (1) as regards efficiency, it is to be observed that plans 3 and 6 alone fulfil the requirements of the Government in locking the points, and at the same time in preventing their being opened during the passage of a train.

(2.) Of these two plans, regard being had to facility of working, the earlier one, No. 3, requires two handles to work it. In one position of the switches, the two handles have to be parallel to each other, while in the other position they lie in opposite directions, which involves a liability to error on the part of the pointsman. Thus he may put the wrong handles to left and right inadvertently, and this would result in the switches being set contrary to the position intended and unlocked, while in plan No. 6, there is only one handle and only one alternative position into which it can be moved.

(3.) As to the number of parts, the table shows that in plan No. 3 there are 37 working parts as against only 9 in plan No. 6, while the number of fixed pieces in the former is 48 as against 25 in the latter.

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This has an important bearing upon the question of facility of erection in India, and wear and tear, and the effects of exposure to the weather, for it is to be observed that plan No. 3 involves attachments for fixing upon sleepers in 12 different places, while No. 6 upon two only, thereby rendering it far less liable to derangement from settlement, better adapted for a light and shifting soil, and it possesses the further advantage of having the working parts well boxed in and efficiently protected from the effects of climate.

Taking into account the importance of the objects to be secured, and the necessity of having an arrangement simple in principle, involving few moving parts, acting efficiently without undue manual exertion, and at the same time easily and economically maintained, I think Messrs. Brunton and Rapier's apparatus is well adapted for use on railways in India.

Your Chief Engineer, Mr. Joseph Harrison, having gone fully into the details of this apparatus, and having seen it in operation, concurs in the remarks which I have made, and with the advantage of his special and local knowledge, I purpose, in a second report, to make a recommendation as to the extent and cost of apparatus for the further protection of the stations on the Company's lines.

From W. P. ANDREW, Esq., Chairman, Sindh, Punjab and Delhi Railway Company, to the Under-Secretary of State for India, dated Gresham House, Old Broad Street, London, E. C., the 23rd February 1871, No. 114.

In continuation of my No. 101 of the 4th instant, relative to the proposed adoption of some improved description of points for railways in India, with a view to the prevention of accidents arising from the errors of pointsmen, etc., I have now the honour to enclose herewith, for the information of the Secretary of State for India in Council, copy of a letter addressed to me on the 3rd instant by the Consulting Engineer of the Company in reference to the application to the Sindh, Punjab, and Delhi Railway of a system of locked and protected switches recommended by him in a report, dated 13th January 1871, of which a copy has already been furnished to the Secretary of State.

The Directors purpose transmitting copies of these papers to their Agent at Lahore, who will be instructed to communicate with the Local Government on the subject, in order that the matter may be fully considered before a decision is come to, as to whether or to what extent it is desirable that Mr. Bidder's recommendations should be adopted.

From G. P. BIDDER, Esq., Secretary, Sindh, Punjab and Delhi Railway Company, to the Chairman, Sindh, Punjab and Delhi Railway Company, dated Great George Street, Westminster, S. W., the 3rd February 1871, No. 24.

In continuation of my report of the 13th January, I have now to consider the application of the system of locked and protected switches to the Sindh, Punjab, and Delhi Railways.

The minor stations at which trains pass one another are traversed by two lines of Railway, communicating with each other at each end, and of necessity by facing points, besides having in many cases intermediate cross-over roads involving two more sets of points to afford the necessary facilities for passing to the platform, which is situated on one side of the station only, either of the approaching trains.

There may be one or more sidings leading out of the platform road, but it will be sufficient, at any rate for the present, to protect by means of the apparatus already described the four sets of points I have indicated.

The most certain and efficient way of doing this and of working the signals will be to fix all the handles together on the platform, and they would be so connected by simple mechanism as to secure—

Meeting trains to clear one another.

1. That the switches of the passing place shall always be set so as to throw two meeting trains clear of each other.

2. That the distance signal cannot be set to safety unless the switches have first been correctly placed; and, after the distant signal has been set to safety, the switches cannot be altered until the signal has again been put to danger.

Distance signals indicate danger unless switches are in a safe position for an entering train.

3. When a train is approaching a passing place, the driver will be informed whether his train will take the right or left-hand road, *not*, however, by the distant signal, but by the arrow or indicating signal nearer the station; the necessity for being on the look-out for the signal will tend to make the drivers careful in approaching the points at a moderate speed, so as to have the train completely under control, either for the purpose of turning out of the main line, or for that of stopping entirely should there be trucks or other impediments in front on the same line.

Driver is informed by signal which line his train will enter upon.

4. The switches and signals are so arranged that either train can be brought first into the platform road as may be desired by the Station Master; and while he is awaiting the arrival of the trains, he can see at a glance whether the switches and signals are properly set for carrying into effect the desired arrangement.

Station Master can see for himself whether the switches are correctly set

5. He has the power, by means of a key which he alone should keep, of passing a special or non-stopping train through the station on either line of rails, the driver of such train being informed at the arrow signal which line of rails is clear for him.

Station Master alone has the power of deviating from the regular mode of working the station.

Minor Stations.

The cost of fitting each minor station, packed and delivered complete in London, will be 338*l* on the Delhi, and 256*l*. on the Sindh and Punjab lines. The difference of cost arises from the fact that, on the Delhi line, the cross-over roads are so frequently used as, in Mr. Harrison's opinion, to require protection, while on the Sindh and Punjab the less frequency of trains renders this at present unnecessary.

A considerable portion of the above outlay, namely, 174*l*., is for the lengths of iron rods, rollers, pedestals, etc., required for carrying into effect the connected action of the points and signals, but it is to be observed that a considerable saving is thereby made in the number of Native pointsmen, as one will do the work now requiring four, the saving in wages alone representing nearly 14 per cent. upon the outlay of 174*l*., and more than 7 per cent. upon the cost of the apparatus complete in England, to say nothing of the advantage of restricting the responsibility to one pointsman instead of incurring the risk of accidents occasioned by the errors of four.

Large Stations.

Of these the Phillour Station may be taken as a type. There are two platforms and numerous lines of railway, giving access to goods sheds, engine and carriage sheds, fuel stages, etc., but the general arrangement of the main and platform lines is, for the most part, an extension of the plan and of the length of the minor stations.

Now, in England, the mode of working large stations like that at Phillour is usually to divide the station yard into two or three lengths, under the control of as many signalmen.

A signal box is provided for each group, in which are fixed the levers for working the switches and signals appertaining to the district or sub-division of the station yard to be controlled.

This plan answers well in this country, where the trains are numerous and regular in their character and movements, but in India, owing to the varying circumstances of the trains and the irregularities of the shunting required, Mr. Harrison does not think this arrangement would be advantageous, besides being very costly.

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The English system would also require Europeans to work it, and from the nature of the climate the day of twenty-four hours would have to be divided into at least three periods of eight hours each, and therefore at least six European signalmen would be required for each large station, even if two signal boxes sufficed for marshalling the traffic.

The better plan would, therefore, appear to be to have four Native pointsmen stationed at intervals along the station yard in such a manner that each could easily manage three or four sets of switches if furnished with locking apparatus, and in that case one-third of the present number of pointsmen would be sufficient to work the traffic, and this duty would be more efficiently performed.

The cost of the English system, applied to Phillour, would be from 1,400*l*. to 1,500*l*., while that of the plan recommended above would be only 451*l*., or about one-third of the outlay; while in the expense of working the advantage is also greatly in favour of the latter, which involves at most eight natives only as against six Europeans.

Again, as compared with the present system, the wages of the Native pointsmen saved will represent in this case 14 per cent. of the total cost of the apparatus in England.

It may be thought that the outlay on the minor stations is large when compared with that proposed for the larger ones, but the fact is that nearly three times as many points are protected in the latter as in the minor stations, but the lengths of coupling rods, etc., connecting the signals are of necessity dispensed with owing to the great length of the station [unless the lever frame of the English system were adopted], and the signals will be worked, with slight modification, as at present.

In conclusion, I beg to give a summary of the cost of applying this apparatus to the Sindh, Punjab, and Delhi lines, respectively, with a view of giving practical effect to the recommendations of the Bombay Government.

Estimate of cost.

	£
Sindh Line—	
For 5 minor stations, at 256*l*.	1,280
For 3½ larger stations, at 451*l*, say	1,435
	2,715
10 per cent. extra sets	271
5 ,, extra parts	135
	3,121
Punjab Line—	
For 16 minor stations, at 256*l*.	4,096
For 6 larger stations, at 451*l*.	2,706
	6,802
10 per cent. extra sets	680
5 ,, extra parts	340
	7,822
Delhi Line—	
For 18 minor stations, at 338*l*.	6,084
For 5 larger stations, at 451*l*.	2,255
	8,339
10 per cent. extra sets	834
5 ,, extra parts	417
Total...	£9,590

Taking into account the importance of the traffic, there can be no question that the Delhi section should be proceeded with first.

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From the Under-Secretary of State for India, to the Chairman, Sindh, Punjab and Delhi Railway Company, dated India Office, London, the 2nd March 1871.

I AM directed by the Secretary of State for India to acknowledge receipt of your letters of the 4th and 23rd ultimo, Nos. 101 and 114, and to acquaint you in reply that copies of Mr. Bidder's reports regarding points and crossings, therewith received, will be forwarded to the Government of Bombay for information.

No. 500. ORDER THEREON, 29th July 1871, No. 1,990.

RAILWAY, No. 57.

COMMUNICATED to the Consulting Engineer for Railways.

(True Extract.)

Captain, R.E.,
Under Secretary to Government.

To the Acting Consulting Engineer for Railways.

Exd. E. C. Shunker.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

RAILWAY.

To

Nos. 1143—53 R.

Dated Simla, 4th July 1871.

Received 13th July 1871.

Enclosure one & 3 drawings.

Measures for the prevention of accidents to trains while passing through points and crossings.

No. 3355

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UBLIC WORKS.

Re Consulting Engrs for Railways

4

29 July 1990.

Nos. 4991 500

Accidents Railways —

Rec. & file for. Regarding Correspondence regarding Measures for the Prevention of Accidents at Rail Level passing through Parliamentary Constituencies & the Inspectorate for Railways.