Sir,

I have the honour to report, for the information of the Minister of War Transport, the result of my Inquiry into the circumstances of the fire which occurred at about 3.30 p.m. on April 28th 1941, on an express passenger train near Westborough signal box on the Grantham-Doncaster main line of the L.N.E.R.

The second portion of the 12.45 p.m. express, Kings Cross to Newcastle, was running at about 55 m.p.h. when a fire broke out in the last coach but one, and gained hold with such rapidity that, by the time the train had been stopped, the coach was blazing fiercely and it was impossible to deal with the fire or to uncouple the coach; the coach ahead was uncoupled from the leading portion of the train which was drawn away, but the fire spread to the coaches next ahead of, and in rear of, the turning coach, with the result that all three were burnt out down to the underframes.

These three coaches, two open vestibule thirds and one brake van, were occupied by about 100 boys returning to Ampleforth College, and I regret to state that six of the boys lost their lives and seven were injured, mainly from burns and shock.

The train consisted of 11 coaches, all 8-wheeled bogies with Pullman vestibules and buckeye couplings, and all fitted with the vacuum brake and lit by electricity; its total weight was about 340 tons. It was drawn by engine No. 4779 Type 2-6-0 Class V 2 with 6-wheeled tender, weighing 145 tons in working order.

The weather was fine with a fresh wind from the East.

DESCRIPTION OF SITE.

The line runs from Grantham, 105½ mile post, in a direction generally north west through Barkston Station and Hougham Station to Westborough signal box.

Distances from the point at which the engine of the train came to a stand are:

<table>
<thead>
<tr>
<th>Location</th>
<th>Distance Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grantham Station</td>
<td>about 8 miles South East</td>
</tr>
<tr>
<td>Hougham Station signal box</td>
<td>1 m. 1640 yds.</td>
</tr>
<tr>
<td>Westborough Down outer Distant</td>
<td>1,200 yds.</td>
</tr>
<tr>
<td>&quot; inner &quot;</td>
<td>480 &quot;</td>
</tr>
<tr>
<td>&quot; Down Home and Signal Box</td>
<td>490 &quot;</td>
</tr>
<tr>
<td></td>
<td>North West</td>
</tr>
</tbody>
</table>

The gradient is falling continuously from Grantham, at 1 in 300 from Hougham to the Westborough outer Distant, and 1 in 550 thereafter. The line is practically straight and on low bank.

Peasecliffe Tunnel, 1,000 yards long, lies between Grantham and Barkston.

Hougham signal box is on the up side of the line and Westborough signal box on the down side.
DESCRIPTION OF ROLLING STOCK.

The 8th coach of the train was a corridor brake composite No. 1885; this was the last coach of the ordinary portion of the train and the brake portion was occupied by the guard. In rear of this were the three coaches reserved for the school viz: two open bucket seat thirds No. 24083 and No. 22508, and brake van No. 41%. they would have been detached from the express at York, and worked thence over the branch line to Gilling station. All were of the Company's standard construction with timber bodies on steel underframes. The two open thirds were built in 1934. They had the leading end and a vestibule reached through a hinged door opening outwards from the main body of the coach, and in the vestibule a platform door, opening outwards, on each side, as well as the door of the gangway connection opening inwards towards the coach. At trailing end of each was a similar but larger vestibule, reached through a similar door opening outwards from the body of the coach with a lavatory on each side, the doors of these opening inwards in the lavatories, and platform and gangway doors as at the leading. The four platform doors of each coach had the ordinary strap control lifting windows, and outside handles.

The platform at Kings Cross from which the train left was on the near side and all four platform doors of the two coaches on this side were in use there. At the time of the accident all the eight platform doors on both sides of the coaches were unlocked and were actually used.

The gangway doors at the leading end of the leading coach and the trailing end of the trailing coach were locked by the guard in accordance with Railway regulations. The gangway doors between the two coaches were held open.

The seating accommodation in this type of coach consists of open bucket seats arranged in groups of 4 on either side of the central gangway with a table between each group. The bucket seats themselves have a wooden framing mounted on metal pedestals, the seats and back cushion being sprung and padded with horsehair pads with wadding, with a roll edge around the back and sides filled with sponge rubber; the seat and back cushions are covered with moquette and the front of the seat and the roll edge covered with leather. The backs and undersides of the seats are covered with plywood, and on the plywood backs there is a thin layer of wadding, and Rexine.

The interior panelling of the coach is plywood covered with Rexine. Steam heating pipes run along the sides at floor level enclosed in a metal cover and insulated at the back by asbestolite.

The electric wiring is run along the roof with drop leads to the bracket fittings; the batteries are under the centre of the coach and the dynamo etc., under the trailing end, with the main switch and fuseboard in the gangway between the lavatories, also in the trailing end. As, however, the evidence of the origin of the fire makes it clear that the electrical installation was not concerned, I do not propose to discuss this in further detail.

REPORT.

Guard Dear was in charge of the train from Kings Cross. He had locked the gangway door leading to the rear brake van on leaving Kings Cross, and after passing through Welwyn Tunnel he again passed through the two passenger coaches to see that the lighting control switches had operated correctly and switched off the light. He again walked through to see that the lights were on before Stake Tunnel, south of Grantham (about 40 minutes before the accident) intending to leave them on until after Peascliffe Tunnel, and he then returned to his brake locking the gangway door behind him. The train was standing in Grantham station he walked down the side
the coaches and looked in casually but saw nothing unusual. He was in the trailing end of his brake van writing at his desk when he felt a moderate brake application, not sufficient to open his van valve, and thought it was probably due to a signal against the driver; he finished his writing and in about half-a-minute looked out of his window on the near side and saw the Westborough down home signal at danger. This signal had just been replaced by the signalman, when he saw that there was something wrong with the train and that it was slowing down.

Dear then looked back and saw boys throwing bags out of the coach and some jumping out before the train had come to a stand; he also saw flames and smoke coming out of the roof of the coach next but one behind him. As soon as the train came to a stand he went back on the near side to the leading end of this coach and got in immediately the boys emerging left the door clear. He asked some of the boys if all were out and they said they thought so.

On entering the coach he found it full of flames and very dense black smoke and it was quite impossible to go through it. He shouted several times "Is anybody in here" but got no reply, and he then got out of the coach by the leading door on the offside, went down to the trailing end and tried to uncouple the trailing brake van; at this time the fire had not yet reached the trailing end of the burning coach. Dear was waiting to signal to the driver to set back so as to ease the buckeye coupling, when he saw that the flames were spreading rapidly forward to the coach ahead, owing, no doubt, to the following wind, and he realised that the risk was greater in front than in rear. He therefore went forward to the leading end of the burning coach and tried to uncouple between that and the coach ahead, 24083, but while doing so burning timber started to fall on him and he was pulled away by a ganger. After that it was clear that the only thing to do was to uncouple ahead of coach 24083, which they did, and the leading portion of the train was drawn ahead leaving the two coaches and the brake van, the latter being hardly alight at this time.

Dear considered and discussed with the other staff and some passengers the possibility of using the fire extinguishing equipment on the train, and some other equipment which was brought from Hougham station, but all agreed that the fire had gone too far for this to be of any use.

Driver Smith was in charge of the engine which brought the train from Grantham. He said that they left about 15 minutes late, with 30 inches of vacuum, and were running easily at about 50 to 55 m.p.h. when, he thought between the outer and inner distant signals of Westborough box, he noticed the engine beginning to pull hard; he looked at his vacuum gauge and saw that he had lost about 5 inches of vacuum. He looked back along the train on his near side and told his fireman to do so on the offside but neither could see anything wrong; he was thinking of coming to a stand at the box about 1,000 yards ahead so as to be handy to a telephone, in case a doctor or other assistance was needed, when he saw his gauge had fallen about another 5 inches, and he then made a full brake application and came to a stand. He estimated that from the time he felt the first application till the time he came to a stand was about one minute.

Evidence as to the origin and progress of the fire was given by 14 of the boys who were travelling in the trailing coach No. 22508 and by the master in charge, Revd. D. Pozzi, who was travelling in the coach ahead, No. 24083, every assistance being given to me by the college authorities in this connection; this evidence may be summarised as follows:
Most of the seats were occupied and the boys, whose ages ranged from about 14 to 18, were reading, playing cards etc.; there is no evidence of any unduly rowdy behaviour. Some of them were however, flicking lighted matches at one another, and one of these, still alight, fell down between the seat and the side of the coach at a point about one third from the leading end on the off side. A boy sitting in this seat thought the match had gone out but shortly afterwards noticed a smell of burning; he and other boys took the seat cushion out and tried to beat out the fire and to put it out with water from the lavatory, but no adequate quantity of water could be carried in time, though one boy used a hat to carry water and another got a mug from his suitcase. One boy got under the table in his endeavours to reach the fire and then saw a little fire alongside the side of the coach and, reflected on the floor, the light from other flames in the inverted Vee-shaped space between the backs of the seats. Shortly after this the flames emerged into the gangway and side of the coach, and spread up the side and along the roof with extraordinary rapidity, being no doubt fanned by the strong draught from the open sliding glass ventilators at the top of the windows and the extractor ventilators in the roof. The flames were accompanied by an extremely dense and suffocating smoke.

Apparently the boys did not at first realise that the fire was serious but, as soon as they did, one of them went to tell their master in the next coach, who immediately came in, told a boy to pull the communication cord (actually, I think, it had been pulled already by another boy) and went forward to the leading end of the next coach to try to get an extinguisher from the guard’s van ahead. He found however, that the gangway door was locked, and was much alarmed as he had the impression that the train speed was not being reduced in spite of the cord having been pulled; he then pulled the cord in his leading coach and noticed the train slowing up.

The boys at the leading end of the burning coach had taken their things and moved forward into the coach ahead, while most of those further back went to the trailing vestibule and a number jumped out of both doors before and after the train came to a stand. The evidence indicates that boys were still getting out of these coaches for about half a minute after the train came to a stand and as noted above, at this time the fire had not reached the trailing end of the coach.

The smoke became so dense and suffocating in a very short space of time that one boy, in the crowd pressing into the vestibule, felt he was fainting and had to hold on to the boy in front; while others thought they would never get away in time in the crowd for the vestibule, and one got out through the top ventilator of a window, while others broke windows and jumped through them before the train stopped, having almost miraculous escapes with trifling or minor injuries.

CONCLUSION AND RECOMMENDATIONS.

It is clear that the origin of the fire was due to the matches which were admittedly being flicked about by some of the boys; one of which fell between the side of a seat and the side of the coach and started a small fire in a very inaccessible position. It should be borne in mind that the heat of the head of a match at the moment after bursting into flame may be very much greater than the normal flame therefrom; there is also a distinct possibility that the match may have fallen on paper or cellophane which had lodged on the side of the seat.

As the result of certain experiments mentioned below, I think it is unlikely that the fire originated from a cigarette end.
It must be admitted that persons older and more responsible than schoolboys often show a lamentable carelessness in throwing down matches and cigarette ends without taking care to see that they are extinguished; it is to be hoped that this deplorable accident may be a warning as to the possible results of such carelessness.

I think that there was among the boys in the coach an unfortunate lack of appreciation of the fact that in a vehicle moving at high speed the draughts which usually exist are likely to cause the rapid spread of any fire, so that immediate action to smother it is essential, however trifling the initial outbreak may appear.

In the absence of the master in charge, who was in the coach ahead, I should have expected some of the senior boys to have put a stop to such a dangerous practice as flicking lighted matches, if they had noticed it, but in any case I think that they should have taken more drastic action towards extinguishing the fire and to have informed their master immediately, when they noticed that something was burning; I could get no reliable evidence as to the time which elapsed before they called Father Pozzi, but it is clear that by the time he arrived the fire was well under way.

At my Inquiry, reference was made to the relics of a chemical cabinet which were found among the debris of the burnt out coach, but I am satisfied that this had no connection with the outbreak of the fire and that it can only have had a negligible effect on the fire in its later stages.

I think that Guard Dear took all action which was reasonably practicable to ascertain whether all the boys were out of the burning coach and to prevent the spread of the fire.

The following points appear to require consideration:

(a) The time taken to stop the train after the communication cord was pulled.

(b) The locking of gangway doors.

(c) The fire risk of the equipment of the coach.

(a) The pulling of the cord in one coach opens a small valve in the vacuum pipe of that coach, and the brake effect is small compared with that of a full brake application by the driver. Repeated pulling of the same cord produces no increased effect but pulling in another coach opens the valve in that coach and thus increases the fall of vacuum and the brake application.

It is clear that the original fall of vacuum noticed by Driver Smith was due to the pulling of the cord in coach No. 22508 while the further fall noticed by him was due to the cord in No. 24083 being pulled.

The definite statement by one of the boys, who had been watching mile posts and timing the speed of the train (56 m.p.h. just before), that the cord was first pulled just after mile post 112, indicates that the stop took about 1 1/4 miles, which, having regard to the speed and the falling gradient, is not unreasonable, taking probably about 3 minutes. I do not think that Driver Smith can have taken any appreciable action to hold the brake off and to run on to the signal box. As regards Father Pozzi's opinion that the train was not slowing after the first cord had been pulled, I think this may have been due partly to natural anxiety, and partly to the fact that the speed reduction curve for any brake application is convex and very flat in the initial stages, so that the reduction from 55 m.p.h. to, say, 40 m.p.h. may take about as long as the remainder of the time from 40 m.p.h. to a stop.
The communication cord instructions prescribe that when the driver observes that the brake is being applied he must infer that the communication cord has been used, and must stop his train with little delay as possible. It is added, however, that he must use discretion in stopping, it being undesirable to bring the train to stand on an overbridge or a viaduct, on catch points, or in a turn or places of similar character.

In view of Driver Smith's statement that he was considering running on to the signal box for the sake of proximity to a telegraph, I think it may be desirable to emphasise to engine men that such action would not have been a justifiable exercise of a driver's discretion, and in the absence of a definite reason against an immediate stop, such as are specified in the instructions above, a driver should take immediate action to stop as quickly as is prudent.

(b) Locking of gangway and corridor doors in corridor without restaurant cars, is prescribed in the regulations of all British Railway Companies. Apart from the obvious purpose of keeping first and third class separate, there are several more important reasons for this practice, in particular avoidance of theft and pilfering from parcels, mail bags and luggage in brake vans not occupied by a guard, and avoidance of tampering with the brake equipment in similar vans. In the case of a train with a restaurant car these disadvantages must be faced, but they are not so acute, the reason that a number of passengers are likely to be passing at the train, and any such action is likely to be observed, whereas a train without a restaurant car, a thief, with an accomplice to work him, has much greater opportunities of working undisturbed.

In this particular case, I am not entirely convinced that the locking of the door into the trailing van had any material bearing on the casualties, and I am doubtful whether the fire extinguisher which could have been obtained if the door into the van ahead had been locked, would have been of use in dealing with a fire which that time must have been spreading rapidly in the strong draught.

The question is, however, whether the real everyday arguments in favour of locked doors are counterbalanced by the comparatively few emergencies when open doors might be preferable.

I think that in the case of unoccupied brake vans, whether at the leading or trailing ends of a train or located intermediate there is adequate justification for maintaining the existing practice of locking the doors. I question the justification for locking gangway and corridor doors between passenger accommodation of different classes, and I think that in the case of composite coaches with doors only, the locking of a corridor door halfway down the coach between first and third, is undesirable.

I recommend, therefore, that the Companies should consider the question of an amendment to the existing regulations on the basis of the two points.

(c) As regards the fire risk of the construction and equipment of the coach, no useful purpose would be served in present circumstances by discussing once again the comparative merits of timber and steel construction, apart from the fact that it is not really relevant to this case.

The internal finish and seating have been described earlier, and the design and materials of the seats are substantially identical with those generally provided on modern road motor coaches. I have carried out a number of trials with various methods of ignition, matches, cigarette ends, paper, etc., aided by the draught of a fan, on the various materials, culminating in a test almost of destruction of 4 seats. I am satisfied that under normal condi-
the fire risk is no greater than that of any ordinary type of seating. The sponge rubber in particular is so well protected by the leather covering that even after 5 minutes or more of intense heat and flames it was only just beginning to catch, though when it is once alight it burns, as is to be expected, with considerable force. The same applies to the horsehair stuffing of the seats and backs and the Repp covering of these is distinctly fire resistant.

On the other hand, it was clear that a flaming match falling between the side of the seat and the side of the coach, especially if it fell on paper, etc., which might easily have lodged there, might well set fire to the surface of the Rexine of the side of the coach and/or the seat back. This point is immediately above the heating pipes and is rather inaccessible, so that everything is very dry and it is a likely place for the accumulation of fluff. Such a fire burns the surface finish of the Rexine slowly with a small flame, and if accessible is easily extinguished without the fabric itself being ignited; but the space between the seat backs is not accessible and the backs form a natural flue to enhance any draught and lead the flame up. Experiments showed that uncovered plywood was materially more resistant to such a flame than plywood covered with Rexine, and, having regard to the inaccessibility of the backs of the seats, I think that it might be advisable to omit the layer of wedding and Rexine covering at present used, leaving the plywood backs bare. The primary object of the rexine is to give a smooth and durable finish and these points are not material in respect of the seat backs.

Except for this point I see no reason to think that the equipment of these coaches does not provide every reasonable degree of fire resistance, for main line as opposed to Tube rolling stock.

I have the honour to be,

Sir,

Your obedient Servant,

A.C. TRENCH,

Colonel.

The Director General,
Ministry of War Transport.