



DEPARTMENT OF THE ENVIRONMENT

# RAILWAY ACCIDENT

## **Report on the Accident that occurred on 4th May 1971 at Tooting Broadway**

ON THE  
NORTHERN LINE  
LONDON TRANSPORT RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE

1972

16p NET

RAILWAY INSPECTORATE,  
DEPARTMENT OF THE ENVIRONMENT,  
2 MARSHAM STREET,  
LONDON, S.W.1.

12th November 1971.

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Order dated 14th May 1971, the result of my Inquiry into the accident that occurred at about 19.40 on 4th May 1971 in which a 7-car empty tube train crashed into the tunnel end wall of the Tooting Broadway reversing siding on the Northern Line of the London Transport Railways.

The train had entered the southbound platform at 19.39 and all passengers had been detrained. The shunting signal had then cleared for it to enter the siding which lies in a section of tunnel between the two running line tunnels to the south of the station. Shortly after its departure, station staff heard a loud bang and the current was automatically switched off. The station master went into the tunnel and shortly after called the emergency services which arrived promptly. Firemen got to the driver by going both through and underneath the train and access was later achieved through a cross-adit from the northbound tunnel, but it was not until 01.10 that the driver could be released from the wreckage. I regret to report that he died before arriving at hospital.

The damage to the train was very severe and the leading two cars had to be cut up in situ and the siding could not be brought back into service until 2nd June 1971.

A similar accident occurred in this siding on 6th October 1960, but the damage then was not so severe, and the driver did not die of his injuries.

#### DESCRIPTION

##### *The track*

1. Figure 1 opposite shows the scene of the accident. The entrance to the siding starts some 40 feet beyond the end of the southbound platform of Tooting Broadway Station. The entrance line to the siding curves right and then left at radii of 5 chains to the exit facing points some 330 feet from the platform end. The siding is almost straight and level thereafter to the start of a sand drag some 380 feet clear of the trailing points. The sand drag is 33 feet long and terminates in the concrete end wall of the tunnel. Mansized cross-adits connect the siding to the running line tunnels on either side halfway along the sand drag. The end wall of the siding tunnel is of concrete.

##### *The signalling*

2. The starting signal on the southbound platform at Tooting Broadway for a train proceeding to Colliers Wood is a two aspect green over red colour light signal situated 12 feet inside the tunnel on the offside tunnel wall, and beside it is a 15 inch diameter flood-lit disc shunting signal controlling access to the siding. Only one of these signals can clear at a time after No. 5A points have been set in the correct position. Both signals are repeated on the tunnel headwall facing down the platform so that guards and platform staff can check that the correct signal has cleared. Beside the repeaters there is a 10 m.p.h. speed restriction board. The station master's office is beside the repeater signals at the end of the platform.

3. Inside the siding, there are eight 3½ inch diameter amber lights equally spaced at 50 feet intervals along the offside tunnel wall, the first light being close to the exit facing points. There is an unlit Stop board for 4-car trains part way down the tunnel on the nearside wall, and a 7-car board some 4 feet short of the sand drag. A red electric stop light is mounted on a 3-foot post in the centre of the track a few feet into the sand drag, and at the time of the accident there was also a red oil lamp almost certainly alight beside it on the sand for use by trains stabling in the siding. The electric stop light and the 8 amber lights are powered by traction supply and cannot be switched off. In addition to the amber lights, there is normal white tunnel lighting consisting of bare electric lamps, on the offside tunnel wall. It was decided to keep this lighting on at all times after the previous accident, and the amber lights were added later to remind drivers that they were entering a siding and were not on the main line.

4. There are only two other reversing sidings in tunnels on the Northern line. One is at Archway on the High Barnet section where the tunnel length is 468 feet (compared with 373 feet at Tooting Broadway) and the other is at Kennington, 8 stations north of Tooting Broadway, where the Charing Cross and City branches connect. The reversing siding tunnel there is 1,428 feet in length, and there is a subsidiary signal and trip cock at its mid-point to enable two trains to be stabled in the siding together, as is shown in figure 2.

##### *The train and damage caused by the accident*

5. The train was a standard 7-car train of 1938 tube stock formed of two units, with a 3-car unit leading. It had been made up in this formation on 1st May and had run thus for four days until the accident.

It was some 370 feet long over its buffers. The 4-car unit suffered heavy damage to its buffering equipment and car body headstocks, but after the automatic coupler at its leading end had been cut away it was fit to be towed to Morden. During this journey its brakes were found to be working normally.

6. The 3-car unit was wrecked, and was telescoped by some 30 feet. The front of the third car, a non-driving motor car was badly crushed at its front where it had ridden up over the rear of the second car, which was similarly damaged, its floor being vertical for a distance of five feet. The roof of the third car was against the tunnel roof and the rear of the second car had driven the centre conductor rail down through the timber sleepers. The front of the second car had similarly ridden over the rear of the first car and was forced against the tunnel roof, the first car being forced against the sleepers, and both cars had bellied sideways against the tunnel walls. It was almost impossible to get into the first car through the train.

7. The front of the leading car had collapsed back to the first pair of doors, and the driver's seat was forced against the controls which were pressed against the tunnel end wall. The roof of the driver's cab had also descended to within a foot of the controls and the sides of the cab were bellied against the tunnel walls.

#### EVIDENCE

8. *Mr. T. B. Savin*, Assistant Divisional Superintendent told me that *Motorman R. Smith*, the driver of the train involved was 56 years old, had been a driver for 9 years and had never previously been involved in any serious accident. He also gave me *Mr. Smith's* roster of duties prior to the accident. He had worked from about 14.00 to 22.00 from 18th to 24th April with rest days on 20th and Sunday 25th April. He next worked from about 05.20 to 13.20 until 1st May with rest days on 27th April and 2nd May following which he worked as a spare driver, only working as required to replace another driver. On 4th May he reported for duty at 14.00 at East Finchley, but was not required for duty until 19.00 when he took over train 137 southbound from Camden Town via the City lines, and he was due to hand over the train there northbound at 20.26. A study of his duty rotas showed he had last entered Tooting Broadway siding during the week ending 24th April, had entered Archway siding two weeks previously and also during the weeks ending 20th and 6th February, and Tooting Broadway siding in the week ending 30th January. He had not entered Kennington siding since the week ending 26th December.

9. *Motorman J. Clifford* had been a motorman for over 27 years and had known *Motorman Smith* for some 17 years. They reported for duty together at 14.00 and Clifford told me that they joked and played cards for over half an hour before he had to take duty and that Smith was his usual cheerful self. I questioned *Motorman Clifford* whether he was ever unsure of his whereabouts when driving on the underground and he replied that he did sometimes wonder what the last station was, but before going into a siding the station staff call "All Change" and to be lost at that moment seemed most unlikely. He told me that the Tooting Broadway siding was the shortest of them all and he did not think any driver would exceed 10 m.p.h. going into it. He always entered the siding with his controller in the "Series" position and shut off power when he was about half-way down the siding.

10. The driver of the last train to enter the siding before the accident was *Motorman J. W. Moss*. He took over his train at Camden Town southbound and travelled via the Bank arriving at Tooting Broadway at 19.25. He confirmed that all the lights in the siding were on, and he saw both the red stop light and the red oil light below it lit. His evidence confirmed that of *Motorman Clifford* regarding becoming unsure of his whereabouts when driving, and the manner in which he drove into the Tooting Broadway siding. He said that so far as he could recollect there were no lights on in the main tunnels between Camden Town and Tooting Broadway on the evening of the accident.

11. *Guard R. Mendonca* was in charge of train 137 involved in the accident. He joined the train at Golders Green and he saw the drivers change at Camden Town. At Kennington *Motorman Smith* called him by name over the loudaphone to say he was on the train. *Mendonca* told me that he sounded cheerful. He also said that they were held at Kennington at a signal to await a train on the Charing Cross line, and that Kennington is the only place where trains often get checked after leaving Camden Town.

12. *Guard Mendonca* said that he was travelling at the front end of the rear car. He had a running card and knew his train was to reverse at Tooting Broadway. They ran normally to that station and on arrival he cleared the rear three cars of passengers. He noticed that the signal repeater was showing yellow, indicating that both signals were on. He saw the station staff clear the front half of his train and heard them shouting "All Change". He then got back into his car and shut the passenger doors. When he saw the shunt signal repeater showing "Off" he gave the driver the starting bell and the train moved off. He leant out of his door until the train had gone about a car's length and then closed his door. As he did so he saw the station staff walking towards the office. He took out his door control key and picked up his lamp by which time the rear car was entering the tunnel. He then opened the two communicating doors and began to walk through the train. When he was about one third of the way down the next car he was thrown violently forward and fell on his face. He tried to go forward to his driver but could not get through so he returned to the exit points and telephoned the station staff and told them what had happened.

13. I questioned *Mendonca* on how fast he thought the train was going prior to the accident, and he told me he thought it was not going fast because he was not thrown sideways when it went through either set of points. He told me he did not hear power being cut off, nor did he hear or feel the brakes being applied.

14. *Relief Station Foreman P. Riley* was on duty on the southbound platform when train 137 arrived at Tooting Broadway. He went into the first car and shouted loudly "All change here, please". As he approached the first car Motorman Smith got out of his cab, and Riley said "Hallo Bob" to which Smith replied "What-ho mate" as they knew each other. He then went through the second, third, fourth and fifth cars where he met the guard and told him that the train was clear. The guard then closed the doors and Foreman Riley told me that he began walking back along the platform. He saw the siding repeating signal show "Off" and as he was passing the platform exit the train began to move. When he got to the office door he heard a big bang, followed by a smaller bang. Immediately the bell on the platform began ringing, and indicator lights showed that the siding current was off and the tunnel telephone wires were short circuited. The station master answered the telephone but could get no reply so he asked Riley to contact the traffic regulator to stop a northbound train to enable him to go into the siding. Riley also called the line controller and told him that there was trouble in the siding. The guard later telephoned from the siding and told them what had happened, and later still the station master also telephoned and told them to call the emergency services.

15. Riley told me that he thought the driver's cab light was off when the train entered the station because had it been on he would have seen Smith and recognised him. He also told me that when the tail of the train disappeared into the tunnel the tail lights still showed red, and the train seemed to be going at the usual speed for one entering the siding, but he agreed that sometimes it was difficult to tell the difference between a southbound train and one entering the siding.

16. *Station Foreman M. Gillespie* said he helped detain the passengers in the 5th car. He stopped on the platform approximately opposite the middle of the third car and waited for the train to start moving. He heard the points change for the siding, and then the train moved off. As the tail of the train passed into the tunnel he noticed the tail lights were still on, and he told me that the train's speed was as for one entering the siding and definitely slower than a train on the southbound line. He also told me that he was certain he saw the guard walking back through the rear car to change the tail lights or indicator panel, but when I re-questioned Guard Mendonca he was quite certain that he had not walked back.

17. *Station Master A. Robertson* was in his office at the end of the southbound platform when he heard the bang. After telephoning and getting no reply he first tried to enter the siding from the northbound line but dust was pouring out of the tunnel, so he returned to the southbound line and went in that way. He found the back of the train about a car's length ahead of where it should have been, and met the guard at the rear door. He noticed that the amber siding lights were on. He went forward with the guard but it was soon clear that he could not get through to the driver so he returned to the exit points and telephoned Foreman Gillespie to call the emergency services. When the firemen arrived he took them into the siding and he told me that two firemen managed to cut a hole through the wreckage between the leading cars, and between them to reach the front of the train and subsequently open one of the train doors opposite the cross adit, but by then a doctor and nurse had managed to crawl through the train to get to the driver.

18. *Divisional Commander R. A. Thomas* of the London Fire Brigade Wimbledon, who was present at my inquiry, described how two of his firemen McGillivray and Angell managed to crawl forward under the left hand side of the train, McGillivray to the front left hand door and Angell to the very front. Also how fireman Mounter squeezed through the train into the front car and then let McGillivray in by the left hand door, and the main party including himself from the northbound cross adit through the right hand door. He had taken statements from his firemen which he gave to me. Fireman Mounter told him that he heard the driver calling for help, and McGillivray said that when he got into the leading car the driver was conscious because he could hear his replies to Angell who was beneath the driver's compartment. He added that the driver was seemingly conscious though his speech was incoherent at this time. When Commander Thomas got to the driver's cab he found Motorman Smith virtually unconscious. He told me that both Smith's feet were to the right of the master controller, (a quite common driving position for taller motor-men), and his right arm was also free and he was slumped forward over the controller, with his head resting against the crushed front of the coach. His left arm was jammed between the wrist and elbow between the front of the coach and rear bulkhead, and he was also caught between the hips and body on his left side. In getting Smith clear Commander Thomas took a book out of Smith's left hand coat pocket and this was placed with his shoes and cap on a seat in the passenger part of the leading car. Commander Thomas was able to confirm that in getting Motorman Smith out of the cab, none of the controls were moved. He told me that one of his firemen found another book on the floor of the cab to the right of the driver. This book was shown me by *Acting Chief Detective Inspector N. M. King*, British Transport Police. It was a science fiction novel entitled "Farewell Fantastic Venus" and was folded back as if it had been read by someone using one hand to hold it. Inspector King told me that the blood on it was of the same group as Motorman Smith's.

19. *Divisional Inspector G. Huggett* said that he examined the controls after Motorman Smith had been removed. The brake handle on the left of the cab was in the fully "Off" position (forward on the left), and the handle was free to be moved. The reverser key beside the master controller was in the full forward position for full acceleration, and the master control handle was in the full "Parallel" position (which is also forward to the left of its pivot). The reverser key can only be moved when the master control handle is in the "Off" position (forward on the right of its pivot) and Mr. Huggett told me that he checked the interlocking and found it to be working correctly. The dead-man's handle on the master controller was also free. He also found the cab light press switches on the rear bulkhead (which had been cut away), and the "On" switch was in the pressed position.

20. *Mr. J. G. Bruce*, Mechanical Engineer Running, had the brake equipment on the train and the control equipment tested. He told me that the brakes on the 4-car unit were working normally and no blockage was found in the train air pipe between the two units. Both the electro-pneumatic and Westinghouse systems were working properly, although the brake equipment on the leading 3-car unit was too badly damaged to be tested. The top half of the driver's brake controller on the leading car however was tested both electrically and pneumatically and when applied to another body it operated correctly. (The top section of the controller which was tested contains the electrical contacts as well as the air rotary valve, and with this section operative two separate faults would have to occur for both braking systems to fail). The top half of the master controller was also tested and when applied to another body worked correctly. The lower half was too badly damaged to be tested, but it is the upper half that operates the dead-man's handle which applies the brakes. He told me that he had seen damage resulting from impacts up to 12 m.p.h., but it had been very much less than that resulting from this accident. He believed that the train must have been travelling at some 30 m.p.h. when it hit the tunnel end wall.

21. *Mr. T. B. Savin* (recalled) also described to me the previous accident which occurred on 6th October 1960 in very similar circumstances. The driver, *Motorman R. J. Collins* who later had to have a leg amputated could, at the time, remember nothing of the cause of the accident. I interviewed him and he could still remember nothing. In fact he told me that the shock of the present accident had upset him. *Mr. Savin* also described to me the additional steps then taken to improve safety in the siding including the provision of the sand drag, the electric stop light and the amber lights on the tunnel wall, all of which were applied to the other sidings as well except where they had already been provided.

22. *Mr. Savin* told me that he timed *Foreman Riley* walking from the platform exit to the office door, and found that he took 29-30 seconds. I repeated the test and I asked *Foreman Riley* to walk more slowly than usual, and he took 31 seconds. I am confident, therefore that the train took not more than about 30 seconds from the time it started until it hit the end wall.

23. I visited the siding and looked for signs of skidding on the rails under the train but found none. There were clear  $1\frac{1}{2}$  inch long marks on the rails under the wheels of one bogie of the 2nd car which were still on the rails, which seemed to show that the brakes were fully applied and the axle locked as the wheels fell back onto the rails after the impact had occurred. No other unusual marks could be found.

24. I have seen the report of the post-mortem inspection of *Motorman Smith* and nothing was found to indicate that he had a black-out of any sort. *Professor R. D. Teare* who carried out the examination told me that there was a very small possibility that *Smith* could have had a black-out and that it was not subsequently detectable because of the injuries he sustained in the accident; but he did check for the normal causes of black-out and found nothing. The report shows he had superficial abrasions on the forehead and on the hands and knees but he had not suffered damage to the top of his head such as he must have received had he been slumped forward before hitting the concrete end wall at speed. The examination also showed that he had taken a small meal; no alcohol or drugs were found in the blood.

#### CONCLUSIONS AND DISCUSSION

25. Calculated curves of the acceleration of a 7-car 1938 tube stock train travelling into the Tooting Broadway siding under full "Parallel" and "Series" control show that there is little difference between the speeds during the first 10 seconds of travel because the automatic control starts the train in "Series" even if the controller is placed fully into the "Parallel" position. The curves show that with the controller in the "Series" position the train would achieve a speed of 20 m.p.h. by the time the leading car hit the tunnel end wall 34 seconds after leaving the platform; and under full "Parallel" control the speed would be 29.5 m.p.h. after some 27 seconds. The tail of the train would pass into the tunnel at 17 m.p.h. and 24 m.p.h. respectively and *Guard Mendonca* at the front of the rear car would traverse the second (left hand) curve (when the train had travelled some 645 feet) at 19 m.p.h. and 27 m.p.h. respectively. Even at 27 m.p.h. the lateral acceleration would be a little less than 0.15 g, and I do not believe that the guard would consider this unusual as he was passing through the two doors.

26. Station *Foreman Riley* could not easily estimate the speed of the tail of the train as it left the end of the platform possibly because he was still some way down the platform. Station *Foreman Gillespie*, who was certain that the train's speed was slower than one departing on the southbound line was also sure that he saw the guard walking back through the rear car, which the guard emphatically denied, and I think it possible that he was confusing the train with an earlier one. The accident damage strongly suggests the higher speed which implies that *Motorman Smith* put the controller straight into the full "Parallel" running position, and I must conclude therefore that he did this as soon as he left the station platform.

27. The lack of braking marks indicated that the brakes were probably not fully applied. The tests which showed that the vital pieces of equipment were functioning, and the positions of the controls indicate that *Motorman Smith* probably did not apply them at all, and did not make an emergency application of the brakes before entering the sand-drag.

28. I cannot be certain what caused *Motorman Smith* to drive as he did. I have sat in the driver's seat of a Northern line train and have simulated a black-out with my right hand on the controller in the "Series" position. As I allowed myself to fall forward the controller naturally moved away from my body into the "Off" position. Even if it had moved the other way into the full "Parallel" position it seemed most unlikely

that the weight of the body on the arm would hold the dead-man's handle in the depressed position. (Its release would make an emergency brake application which, in Smith's case would probably have stopped the train). Finally, the medical evidence and the lack of damage to the top of Motorman Smith's head make this possibility unlikely.

29. Motorman Smith may have been temporarily lost and thought for a moment that he was at Kennington on the southbound Charing Cross line and was to enter the siding there. That siding has a long approach on a steep uphill gradient and leads to a double length siding, and the initial use of full "Parallel" control would not have been dangerous. The platform and office are also somewhat similar although the signalling and track layout are not the same.

30. Had he been driving normally however I believe he must have seen the amber lights which are provided in these sidings. For him to drive as he did in spite of the clear audible and visible signs around him that he was to enter the siding, and discounting the possibility that he suffered a black-out, his mind must have been deeply pre-occupied with other thoughts. I suggest that the second book which was found where it could have fallen from his right hand might have been responsible. Motormen are not allowed to read whilst driving. I sat in the rear driver's seat of a train leaving Tooting Broadway siding with a book in my right hand on my right knee, and my left hand on the controller. As I read the book with the cab light on I was not conscious of the amber lights passing by, and the position of the cab light switch in Smith's cab after the accident indicates that it might have been on.

31. When entering a siding both the signal and the train stop are cleared for the train to proceed and it is in the hands of the driver alone to protect the train and himself from the effects of hitting the tunnel end wall. The amber lights and sand drag may have prevented trains travelling at much lesser speeds from damage, but this accident proves that these aids alone cannot prevent an accident such as occurred in this case.

32. Because this is the second serious accident in Tooting Broadway siding in 11 years; because it is not practicable to lengthen this siding, and because it is only marginally longer than the train it has to accommodate, I asked the Railway Officers of London Transport to consider the provision of a short timing track circuit or similar device which, in conjunction with a train stop halfway down the siding might stop a further accident occurring. The Railway Officers have proposed the provision of a timing section beginning clear of No. 5B points at the entrance to the siding. There will be a special subsidiary signal at the end of this section which will only clear when the section has been occupied for  $4\frac{1}{2}$  seconds when a train stop situated beyond this signal will also clear.

33. Should a train enter the siding under full power, the signal and train stop will not have cleared by the time the train reaches it and the train, which will have achieved a speed of some 26 m.p.h. at the signal, should be brought to a stand at the sand drag. Should a driver pass the new signal and the train stop at the correct speed and then apply full power, he could hit the tunnel end wall at some 24 m.p.h., but I consider this a most unlikely occurrence and I believe the proposed new control should materially improve the safety in this siding.

34. The Railway Officers have also agreed to provide two red electric stop lamps at the end of the siding, so that drivers can more easily judge their distance from them, and to guard against the possibility of even a double filament lamp failure in the existing lamp.

I have the honour to be,

Sir,

Your obedient Servant,

A. G. TOWNSEND-ROSE,  
*Lieutenant Colonel.*

The Permanent Secretary,  
Department of the Environment.

# ACCIDENT IN TOOTING BROADWAY SIDING — 4th MAY 1971

Fig 1.

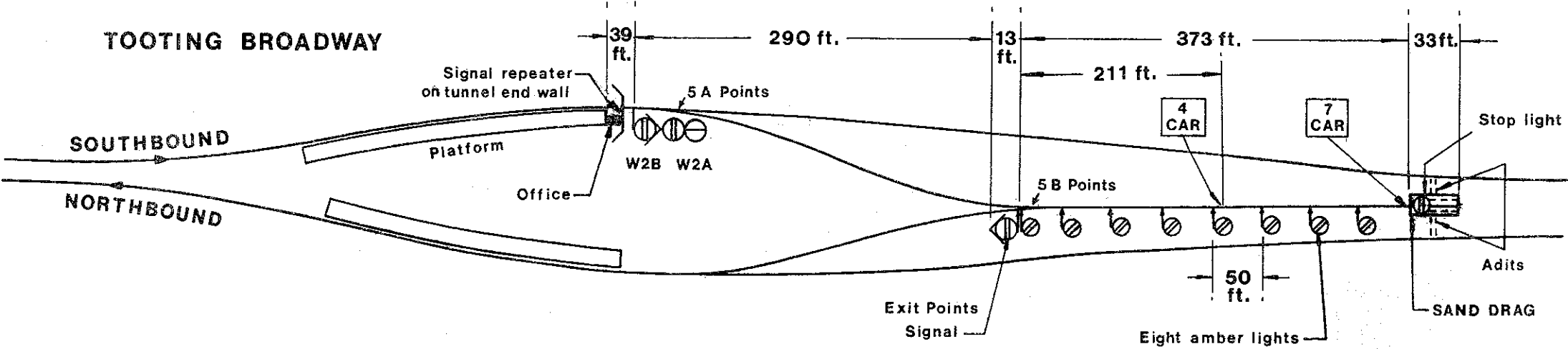
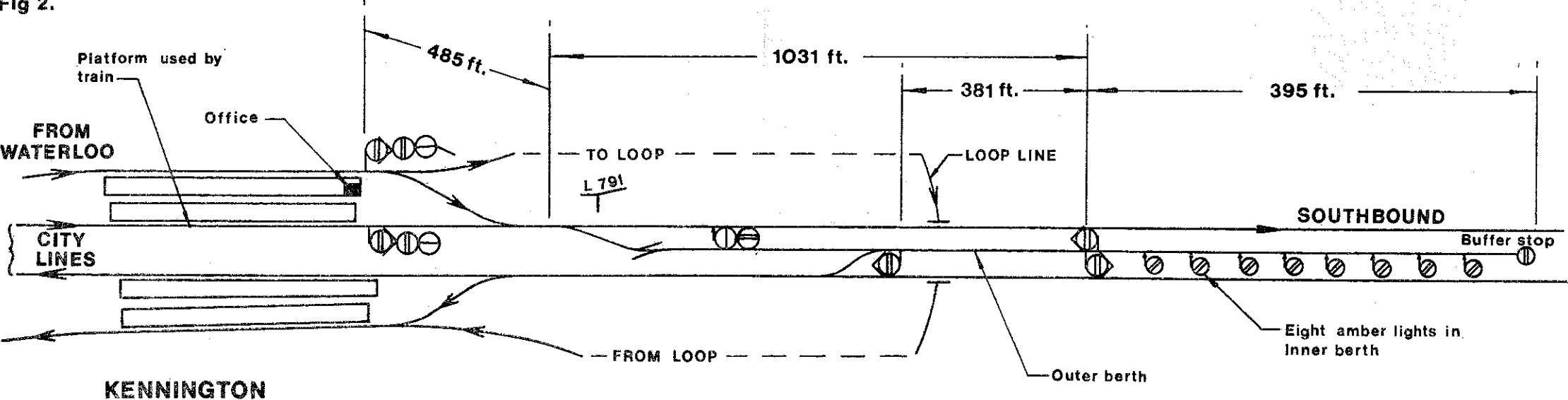


Fig 2.



SHOWING ENTRANCES TO, & LENGTHS OF, DOUBLE SIDING

© *Crown copyright 1972*

Printed and published by  
HER MAJESTY'S STATIONERY OFFICE

To be purchased from  
49 High Holborn, London WC1V 6HB  
13a Castle Street, Edinburgh EH2 3AR  
109 St Mary Street, Cardiff CF1 1JW  
Brazennose Street, Manchester M60 8AS  
50 Fairfax Street, Bristol BS1 3DE  
258 Broad Street, Birmingham B1 2HE  
80 Chichester Street, Belfast BT1 4JY  
or through booksellers

*Printed in Scotland*