IN CONFIDENCE

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JOINT FIRE RESEARCH ORGANIZATION

FIRES IN ROAD VEHICLES [illegible] BY [illegible] IN GREAT BRITAIN 19[illegible]

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[illegible] maintenance [illegible] estimated that [illegible] greater [illegible] this would [illegible] fiction in [illegible] and

by the wiring system. The Fire Brigade reports do not contain sufficiently detailed information to make recommendations towards eliminating these fires. The provision of extinguishers on more road vehicles might lead to some reduction of fire damage.

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FIRES IN ROAD VEHICLES IN GREAT BRITAIN

by

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INTRODUCTION

The yearly frequency of fires in road vehicles to which the Fire Brigades were called increased from 3 700 in 1948 to 6 600 in 1953 (Fig. 1), and it is thought that there are in addition many fires in vehicles which the Fire Brigades do not attend. Serious damage to the vehicle involved is the exception rather than the rule in these fires, but there is always a risk of injury to the occupants of the vehicle, and the steadily increasing number of calls to the Fire Brigades each year, a trend which is likely to continue if no measures to reduce the fire incidence are taken, adds considerably to the work of the Fire Brigade.

This report describes an investigation of reports of fires in road vehicles to which Fire Brigades were called. All the fires occurred in vehicles in the open air and the great majority were in vehicles on the road.

MEASUREMENT OF FIRE INCIDENCE

The numbers of fires in vehicles attended by Fire Brigades in Great Britain are given in Table 1. The vehicles propelled by internal combustion engines constitute by far the largest group, and most of the fires occur in private cars, in goods transport vehicles and, in recent years, in motor cycles.

The numbers of certain types of road vehicles are increasing rapidly, and it would obviously be desirable to measure the relative frequency or rate of incidence of fires by relating the numbers of attendances made by Brigades to the quantity at risk; that is to the volume of traffic for each type of vehicle measured in vehicle miles. It is not possible to do this, so the number of licences current has been used as a measure of the volume of traffic.

In studies of traffic flow the Road Research Laboratory of the Department of Scientific and Industrial Research combines data from its own censuses with that obtained by other organisations to calculate indices of traffic flow for various types of vehicle. In Table 2 a comparison, for each of the three main types of vehicle has been made, between the relative frequency of fires per 1 000 licences actually current, and a hypothetical relative frequency of fires per 1 000 licences, calculated by assuming that the number of licences is directly proportional to the index of traffic flow. The comparison is a little arbitrary since the number of licences in a particular year, 1951, is equated to the base value of the index, 100, but the results suggest that the measurement of relative frequency in terms of licences current is adequate for broad comparisons except for 1949 and, presumably, earlier years, when petrol rationing was in force.

Variations in fire incidence

The numbers of licences current during the third quarter of each year are shown in Table 3, and the relative frequencies of fires per 1 000 licences current per year in Table 4.

For each year except 1948 the numbers of fires attended are derived from the routine analysis of random samples of all reports received from the Fire Brigades. There is therefore the possibility of sampling errors in the estimated frequencies of attendances by Fire Brigades shown in Table 1. The numbers are also subject to chance variations independently of any considerations of sampling error, so that no great importance can be attached to minor fluctuations in the smaller frequencies.

The incidence of fire in private cars is of the order of 0.8 fires per 1 000 licences current per year compared with an incidence of about 2.0 in

goods vehicles and about 1.1 in motor cycles. The incidence of fires in public service vehicles is of the same order as that in goods vehicles. The highest incidence among the oil and petrol driven vehicles occurs in the miscellaneous vehicles, a group including tractors, dumpers, excavators, mobile fish and chip vans and refuse lorries. There is some evidence of an increasing trend in the incidence in this group, but it's importance is not altogether certain, since it is difficult to ensure an exact correspondence between the numbers of fires and the numbers of licences in a heterogeneous group of this description.

The actual numbers of fires in electrically propelled vehicles are fairly small, but there is a general indication of a higher relative frequency in comparison with oil and petrol driven vehicles, particularly in tramcars where the relative frequency is about 30 fires per 1 000 vehicles per year.

THE CAUSES OF FIRE

The causes of fire for the years 1948-53 are tabulated in broad groups in Table 5 for all types of vehicle, and more detailed information on goods vehicles, motor cars and motor cycles is shown in Table 6 for 1952 only. In addition, for each of the more important causes, random samples have been taken of the Fire Brigade reports analysed for 1952. These samples are in fact sub-samples of all the original reports received from Fire Brigades for the year 1952, since in the first place a random 1 in 4 sample of all reports was considered. The relevant information in the sub-samples has been summarized. The summaries have not been reproduced in this note, but the information has been used to expand the descriptions of the causes given in Tables 5 and 6.

In the samples of reports for 1952 which were examined there were some fires primarily due to road vehicles colliding or overturning. As different proportions were sampled in different cause groups no reasonably accurate estimate of the total number of these fires in 1952 is available, but the order of magnitude of the figure was 300 to 400.

As might be expected the distribution of causes varies according to the type of vehicle, but by far the most important group is that concerned with faults in the mechanical and electrical equipment of the vehicles. Sources of ignition belonging to this group account for over 90 per cent of the fires in electrically propelled vehicles and about three-quarters of those in oil and petrol driven vehicles. In the oil and petrol vehicles fires attributed to smoking materials or other sources of ignition in the vehicle, such as hot ashes or combustion of contents, amounted to about 10 per cent of the total, while sources of ignition external to the vehicle accounted for about 5 per cent of the fires.

The causes of fires in the oil and petrol driven vehicles tend to reflect the complexity of the equipment of the vehicles.

Motor cycles.

The major cause of fires in motor cycles, amounting to some 70 per cent of the total, is described in Table 6 as "petrol engine igniting oil or petrol", and consisted very largely of backfires igniting petrol in carburettors. Arcs from short circuits in electric wiring igniting petrol vapour or the insulation of the wiring were the only other known cause of any magnitude.

Motor cars.

The causes of fires in cars were rather differently distributed. Short circuits in electric wire and cable were the source of ignition in half the fires, and the insulation was the material reported as ignited first in the majority of these. The reported information was not sufficiently detailed for particular danger points to be distinguished. Battery leads were specifically mentioned in the reports on some of the fires. In the second most important group of causes the petrol engine was the source of ignition, and generally ignited oil or petrol, although in some cases sacking or blankets placed over the engine or other materials were ignited. About a quarter of the fires were due to this cause. Backfiring ignited petrol in carburettors in some of the fires and petrol leaking from supply pipes was ignited by hot exhaust pipes in most of the others, occasionally after mishaps to the car concerned. In the remaining 25 per cent of the fires 8 per cent were of unknown cause and there

were many minor causes such as smoking materials and matches, and engine heater lamps.

Goods vehicles.

The causes of fires in goods vehicles were even more varied than those in cars. The most frequent causes were short circuits in electric wiring. The relative frequency of these fires was slightly higher than that for cars, but they accounted for 30 per cent of all fires in goods vehicles compared with 50 per cent of all fires in cars. The next most frequent group of causes was that in which the engine was the source of ignition. The relative frequency of these fires was higher in goods vehicles than in cars, though the proportionate frequency was about one-quarter in both categories of vehicles. The greater wear and tear to goods vehicles probably accounts for the fact that the relative frequency of these fires, mainly backfires to carburettors and heat from the engine igniting leaking petrol, was half as much again as that for cars. There were also fires in goods vehicles in which sacking, tarpaulins, rags and other flammable materials were ignited by exhaust pipes.

This tendency for the relative frequencies of some causes to be higher in goods vehicles than in cars was also true of fires caused by smoking materials, matches or other naked lights igniting oil or petrol, upholstery or other contents of goods vehicles. It was estimated that there were over 200 fires due to this group of causes in 1952, some 12 per cent of all fires in goods vehicles.

There were in addition certain outbreaks of fire in goods vehicles which seldom occurred in cars. For example, it was estimated that, in 1952, there were 72 fires in goods vehicles in which friction in differentials, axles, bearings or brake drums ignited oil or grease. Again, it was estimated that, in 1952, there were 100 fires in which ignition of the tyres of goods vehicles took place. The reported circumstances were under-inflation of the tyre and subsequent heating through compression or through friction, presumably between twin wheels. There were also a few fires in which friction from brake drums was reported to have ignited tyres. The estimated relative frequency of fires in which tyres were ignited was 0.1 fires per thousand licences current per year. A further source of ignition peculiar to goods vehicles was combustion caused by loads of hot coke or hot ashes. There were about 50 fires due to this cause in 1952. There were also a few fires attributed to spontaneous combustion of the load or chemical action from substances such as quick lime.

There were just under 200 fires in goods vehicles in 1952 the cause of which was not determined, corresponding to a relative frequency of 0.18 fires per 1 000 licences current, about twice that in cars. There were in addition a few fires due to minor causes such as welding gear, fireworks, children playing with matches (included among the naked lights) and engine heater lamps.

Miscellaneous oil and petrol driven vehicles.

The right hand column in Table 6 deals with the causes of fires in the "miscellaneous" group of oil and petrol driven road vehicles. The high relative frequency of this group has already been noted. To some extent the heterogeneous nature of the group accounts for the high rate of incidence since there are specialised causes, for example fires due to hot ashes in refuse lorries, fires due to fish frying ranges and the temptation offered by derelict vehicles to children playing with matches. The cause of fire described as petrol engine igniting oil or petrol may be connected with the rough work performed by certain of the vehicles in this group.

Electrically propelled vehicles.

The fires in electrically propelled vehicles, though comparatively few in number, are of interest because of their high relative frequency. There is little apparent difference in the causes of fires between tramcars, trolley-buses and other electrically propelled vehicles and most of the fires originated either in resistances, main switches or controllers, or, because of short circuits, in wiring. The high rate of incidence in tramcars is probably due partly to age, and perhaps also to a reduction in standards of maintenance resulting from the general trend towards replacing trams by buses.

THE DAMAGE SUSTAINED BY ROAD VEHICLES

Information on the damage caused by fires in road vehicles, in money terms, is not readily available to the Organization. The Fire Brigade reports which were sampled to provide information on the causes of fires also contained descriptions of the damage sustained. These descriptions have been summarized in broad qualitative terms. Strictly speaking the sub-samples were random with respect to each cause group only, and the information in any sub-sample could be considered to be representative of its cause group only. In fact there is no evidence (see Table 7) that the amount of damage is related to the cause of fire, to within the degree of refinement of the classification of damage used, and in both goods vehicles and private cars about 60 per cent of the fires caused superficial damage only, that is very slight damage to the vehicle requiring at most on the spot repairs, or slight damage to the contents only. The damage in about 20 per cent of the fires in goods vehicles was classed as moderate, that is fire affected a sizeable portion of the vehicle or some particular part was severely damaged. The remaining 20 per cent of the fires in goods vehicles caused severe damage or destruction to a sizeable part of or to the whole of the vehicle. The corresponding proportions in each of the three categories of damage for private cars were roughly 60 per cent, 10 per cent and 30 per cent. These estimates of proportions are subject to chance variations as well as sampling fluctuations and are based on combined samples amounting to 206 reports in the case of lorries and 157 reports in the case of cars. The differences between goods vehicles and cars in proportions damaged, are statistically significant but not strongly so, so that the evidence that cars suffer greater damage than goods vehicles in fires cannot be regarded as conclusive.

While the cause of fire is not apparently connected with the degree of damage by fire, there was in many cases an obvious relation between the cause and the point of origin of the fire.

There is little evidence of a grave risk from hazards such as petrol tanks exploding but there were 8 fires in the random 1 in 4 sample of reports for 1952 in which there were explosions in motor vehicles (6 in vans or lorries and 2 in motor cycles). In one of the motor cycle fires a backfire ignited petrol in the carburettor and the petrol tank exploded spreading the fire to the wooden wall of an adjoining building. The other explosion was caused by a short circuit in electric wiring which ignited petrol vapour and caused the tank to explode. In this case, 6 acres of heathland were also involved. Two of the explosions in vans were caused by ancillary cooking apparatus in mobile caterers' vans, and one was caused by a workman using an oxyacetylene cutter on the petrol tank causing the tank to explode with slight injury to the workman. The third fire was started by a child removing the filler cap and applying a lighted match to the tank of a mobile marionette theatre; two children were slightly injured in the subsequent explosion. There was also a fire due to an explosion in the engine of a van, which caused little damage and no injury. The remaining explosion occurred in the cab of a 6 ton lorry; the cause was not determined and the driver and his mate received fairly severe injuries.

THE METHOD OF EXTINCTION OF FIRES IN ROAD VEHICLES

Information on the methods used to extinguish the fires in road vehicles attended by Fire Brigades which occurred during 1952 is tabulated in Tables 9(i) (ii) and (iii), for goods vehicles, motor cycles and private cars. The actual numbers of fires and the relative numbers in terms of licences current are shown.

Tables 9(i) (ii) and (iii) deal respectively with the three categories of fires attended, (A) those tackled and extinguished before the arrival of the Fire Brigade; (B) the fires in which no attempt at extinction was made before the Fire Brigade arrived, and (C) the fires which were tackled before the arrival of the Fire Brigade but were finally extinguished by the Brigade.

The proportion of all fires tackled before the arrival of the Fire Brigade varied in 1952 between 52 per cent in goods vehicles and 64 per cent in private cars, but the proportions actually extinguished before the arrival of the Brigade were 27 per cent in goods vehicles, 35 per cent in private cars and

41 per cent in motor cycles. This variation probably reflects the effect of the severity of the fire in relation to the quantity of flammable material at risk.

A summary of the information on methods of extinction is given in Table 10 below. Over 60 per cent of the fires in motor cycles or private

Table 10

THE MEANS OF EXTINCTION OF FIRES IN GOODS VEHICLES

Fires attended by Fire Brigades in Great Britain 1952

Frequencies estimated from 1 in 4 random sample

Method of extinction	Goods vehicles		Motor cycles		Private cars	
	Number	Per cent	Number	Per cent	Number	Per cent
Extinguishers or "first-aid" methods such as beating, smothering or buckets of water or combinations of the two	804	42	648	62	1 460	64
Hose reel jets used by Fire Brigade						
- no previous attempt to extinguish fires	548	28	188	18	388	17
- fires tackled with extinguishers or "first-aid" methods prior to arrival of Fire Brigade	304	16	132	13	304	13
Jets from pumps or hydrants	180	9	20	2	76	3
Combinations of methods above; garden hoses, unknown methods	96	5	64	6	96	4
	1 932	100	1 052	100	2 324	100

cars and about 40 per cent of those in goods vehicles are put out by extinguishers or first aid methods such as beating, smothering or buckets of water. In addition nearly 20 per cent of the fires in motor cycles and private cars and nearly 30 per cent of those in goods vehicles are extinguished by hose reel jets by the Fire Brigades with no previous attempt made at extinction. About 15 per cent of the fires in all three categories of vehicle are extinguished by the Fire Brigades with hose reel jets after being tackled before the arrival of the Fire Brigade. The proportion of fires requiring the use of jets from pumps or hydrants was 9 per cent in goods vehicles and 2 to 3 per cent in motor cycles and private cars.

Assuming that the last two methods are used to deal with serious fires, then the proportion of such fires is estimated to be about 25 per cent in goods vehicles and 15 per cent in motor cycles and private cars. A further 30 per cent of the fires in goods vehicles and 20 per cent of those in motor cycles and private cars were not tackled before the arrival of the Brigades, possibly because of the lack of extinguishers or other equipment, and were subsequently extinguished by means of a hose reel jet. It is often Fire Brigade practice to use a hose reel jet as a first method of attack so it should not be inferred that all these fires had grown large enough to require the use of a hose reel jet in place of an extinguisher. On the other hand, of the 548 of these fires which occurred in goods vehicles, 112 were extinguished by hose reel jets using more than the original supply of water carried in the appliance. The remainder of the fires were extinguished by extinguishers or "first-aid" methods, but it is worth noting that although these minor fires amounted to about 40 per cent of all fires attended in goods vehicles and 60 per cent of

all fires attended in motor cycles and private cars, the proportion tackled with extinguishers before the arrival of the Fire Brigade was only of the order of 12 to 17 per cent. A further 16 to 27 per cent were tackled by first-aid methods before the arrival of the Brigade and some 15 to 25 per cent were extinguished before the arrival of the Fire Brigade. There is undoubtedly scope for the greater use of extinguishers both in fires which are not tackled before the arrival of the Fire Brigade and on those which are tackled by first-aid methods. It is estimated that extinguishers, if they had been carried, could have been used to tackle about half of the fires in goods vehicles, motor cycles and private cars before the arrival of the Fire Brigade, and might well have made a considerable reduction in the damage to the vehicles.

INJURIES AND FATALITIES IN FIRES IN ROAD VEHICLES

In the 1 in 4 random sample of fires involving road vehicles attended by Fire Brigades in 1952 one person was killed and 74 were injured. Thirteen of the casualties occurred in one incident when an electrically driven vehicle, a tramcar, was struck by lightning. All the passengers suffered shock and of the 5 who received burns, 2 were detained in hospital.

There were 62 casualties recorded in the sample in oil and petrol driven vehicles. In 10 incidents fire broke out as the result of a vehicle colliding, skidding or overturning and 17 people were casualties, 12 of whom received injuries such as shock, cuts and bruises. Of the remaining 5 casualties who received burns, one person subsequently died. Six people out of the remaining 45 casualties received injuries other than burns.

Four people received multiple burns from outbreaks of fire in road vehicles while 41 received slight burns or other injuries. In 30 of these 45 casualties there were injuries to the hands or arms some of which may have been caused by attempting to smother fires.

THE AGE DISTRIBUTION OF VEHICLES INVOLVED IN FIRES

The Fire Brigade reports on fires in road vehicles almost always include the registration number of the vehicle from which it is possible to determine reasonably accurately, the age of the vehicle. As mentioned in the section on damage, the sub-samples of the reports were random only in respect to the cause group, so in the first place separate consideration had to be given to all cause groups which might be connected with the age of the vehicle. This restriction meant that the numbers of fires in the main cause groups were too small to draw any conclusions from comparisons of the age distributions of the vehicles involved. In fact, only by classifying ages into two groups 0-9 years and 10 years and over, and causes into five groups, as in Table 8, was it possible to obtain frequencies in each cell large enough for a statistical test of the independence of the age and cause classifications to be valid. This procedure was carried out for goods vehicles and private cars. In neither case was there a significant indication of dependence. There may be a tendency for some causes of fire to be linked with the ages of the vehicles concerned but the present evidence is insufficient to decide this.

During 1942 and 1943 very few private cars or motor cycles and comparatively few goods vehicles were manufactured. This circumstance, due to the war, divides vehicles now licenced into virtually two classes, those manufactured before the war and those manufactured since the war. There were considerable differences in manufacturing practice and in the materials used in manufacture, and it would be of interest to see if these had any bearing on fire incidence. Unfortunately it has not been possible to do this. The measurement of fire incidence by relating the numbers of fires to the numbers of vehicles at risk is an approximate method which ignores the age distribution of the vehicles. It is adequate for comparisons of incidence between large classes of vehicles, but it is not likely to be sufficiently accurate to compare the incidence of fires in prewar and postwar vehicles. It is known that very roughly 60 per cent of the private cars with licences current in 1952 were made before the war but it is thought that these cars account for considerably less than 60 per cent of the car-miles run in 1952. The presumed difference in usage between prewar and postwar cars is important in this connection.

CONCLUSIONS

The incidence of fires in road vehicles in Great Britain to which Fire Brigades are called is of the order of 1.3 vehicles per 1 000 licences current per year. The actual number of attendances had risen to over 6 600 in 1953 and constituted nearly 8 per cent of all attendances made by Fire Brigades to fires in Great Britain. It was estimated that in 1952 between 20 and 30 per cent of the fires attended in goods vehicles and private cars caused severe damage or destruction to a sizeable part or the whole of the vehicle. This estimate implies that about 400 goods vehicles and nearly 700 cars were severely damaged by fires in the open to which the Fire Brigades were called.

Three quarters of the fires originated in the mechanical or electrical systems of the vehicles, except of course in the case of horse-drawn vehicles. The relative importance of the two systems from the point of view of fire risk depended broadly on the complexity of the vehicle. The majority of the fires in which the petrol engine was the source of ignition consisted of back-fires igniting petrol in carburettors or leaking petrol or vapour ignited by the engine.

The information available in the samples of reports which were examined was insufficient to draw any conclusions concerning relations between the ages of vehicles and the causes of fires, or variations in fire incidence connected with the age of the vehicle, depending for example on the differences in manufacturing practice and materials used between prewar and postwar vehicles. Fairly detailed information on vehicle-miles run, according to the age of the vehicle would be necessary for this purpose.

While it is a truism to say that better maintenance of vehicles, in particular goods vehicles, would effect a reduction in the relative frequencies of fires, it is apparent that any considerable reduction of fire incidence requires measures dealing with the two major groups of causes, faults in the electrical equipment of vehicles and fires started by the engine. The first requirement therefore is a greater knowledge of the circumstances underlying these fires. This might be obtained through various organisations such as the Fire Brigades, the motoring associations, or possibly the motor insurance companies. Before undertaking such an investigation it would be desirable to know, in broad terms, the monetary loss in vehicle fires and its relation to the risk of injury due to fire, the burden on the Fire Brigades and the possibilities and cost of improvement, from the fire point of view, of the electrical and mechanical equipment of vehicles.

Better maintenance of vehicles (e.g. maintenance of tyre pressures in goods vehicles), and less carelessness with cigarette ends and matches would lead to a small but worth-while reduction in fire incidence in vehicles.

There were many fires in vehicles (approximately half of those attended by Brigades) which were either not tackled before the arrival of the Brigade or were tackled, and in many cases extinguished, by first-aid methods such as beating, smothering, water from buckets and so on. It is presumed that this is because no extinguisher was carried on the vehicle, and it is suggested that the increased provision of extinguishers on road vehicles might lead to a greater efficiency in the extinction of fires and a worth-while reduction in fire damage.

Acknowledgments

The Organization is indebted to the Road Research Laboratory for information on the volume of traffic flow and for assistance in establishing the ages of vehicles.

Table 1

FIRES IN ROAD VEHICLES

The number of outbreaks attended by Fire Brigades in Great Britain 1948-53

Type of vehicle	1948	1949	1950	1951	1952	1953
Electrically propelled vehicles						
Tramcars	118	140	160	124	96	85
Trolley buses	28	44	22	16	32	15
Other electrically propelled vehicles, e.g. delivery vans, milk floats	25	44	42	48	68	60
Vehicles propelled by internal combustion engines						
Goods transport vehicles (vans and lorries)	1 391	1 752	1 856	1 872	1 932	1 895
Motor cycles	263	584	740	922	1 052	1 330
Fire services vehicles	19	12	18	26	36	5
Armed services vehicles	60	32	44	72	52	45
Private cars	1 116	1 536	1 794	1 868	2 324	2 375
Public service vehicles (buses, coaches, taxis)	402	324	240	286	272	250
Petrol and oil tankers	11	8	16	14	32	-
Other vehicles propelled by internal combustion engines, e.g. dumpers, tractors, invalid chairs, mobile canteens and fish and chip vans, excavators, ambulances, etc.	185	316	418	422	460	500
Steam propelled vehicles						
Steam lorries and other steam vehicles	11	12	12	4	12	5
Horse drawn vehicles	46	52	50	86	76	60
TOTAL	3 675	4 856	5 412	5 760	6 444	6 625

Note: The number of fires attended in 1948 was derived from analysis of all reports made by Fire Brigades. In other years the frequencies are obtained by multiplying the results of analysis of random samples of reports made by Fire Brigades; the sampling fractions were 1 in 2 in 1950 and 1951, 1 in 4 in 1949 and 1952 and 1 in 5 in 1953.

Table 2

THE INCIDENCE OF FIRES IN CERTAIN TYPES OF ROAD VEHICLES IN RELATION TO MEASUREMENTS OF TRAFFIC FLOW

	1949	1950	1951	1952	1953
MOTOR CYCLES					
Number of licences current	656 000	754 000	848 000	952 000	1 040 000
Number of fires attended by Fire Brigades	584	740	922	1 052	1 330
Road Research Laboratory index of traffic flow (1951 = 100 for all classes of vehicle)	55	78	100	108	121
Number of fires attended by Fire Brigades per 1 000 actual licences current	0.9	1.0	1.1	1.1	1.3
Number of fires attended by Fire Brigades per 1 000 licences estimated on the basis of the index of traffic flow as active	1.25	1.1	1.1	1.1	1.3
MOTOR CARS					
Number of licences current	2 139 000	2 266 000	2 382 000	2 517 000	2 769 000
Number of fires attended by Fire Brigades	1 536	1 794	1 868	2 324	2 375
Road Research Laboratory index of traffic flow (1951 = 100 for all classes of vehicle)	69	87	100	104	113
Number of fires attended by Fire Brigades per 1 000 actual licences current	0.7	0.8	0.8	0.9	0.9
Number of fires attended by Fire Brigades per 1 000 licences estimated on the basis of the index of traffic flow as active	0.9	0.9	0.8	0.9	0.9
GOODS VEHICLES					
Number of licences current	845 000	897 000	920 000	986 000	1 010 000
Number of fires attended by Fire Brigades	1 752	1 856	1 872	1 932	1 895
Road Research Laboratory index of traffic flow (1951 = 100 for all classes of vehicle)	96	95	100	101	104
Number of fires attended by Fire Brigades per 1 000 actual licences current	2.1	2.1	2.0	2.0	1.9
Number of fires attended by Fire Brigades per 1 000 licences estimated on the basis of the index of traffic flow as active	2.0	2.1	2.0	2.1	2.0

Table 3

THE NUMBERS OF VEHICLES LICENCED

Type of vehicle	1948	1949	1950	1951	1951	1953
Electrically propelled vehicles						
Tramcars ≠	6 000	5 000	4 000	4 000	3 000	3 000
Trolley buses	4 000	4 000	4 000	4 000	4 000	4 000
Other e.g. milk floats, delivery vans	12 000	15 000	16 000	17 000	18 000	19 000
Vehicles propelled by internal combustion engines						
Goods transport vehicles (including petrol and oil tankers)	782 000	845 000	897 000	920 000	986 000	1 020 000
Motor cycles	561 000	656 000	754 000	848 000	952 000	1 040 000
Fire Service vehicles	6 000	6 000	6 000	7 000	7 000	7 000
Armed Services' vehicles	---	---	---	---	---	---
Private cars	1 969 000	2 139 000	2 266 000	2 382 000	2 517 000	2 769 000
Public service vehicles (taxis, buses, coaches)	124 000	129 000	132 000	132 000	128 000	112 000
Other vehicles; dumpers, tractors, invalid chairs, mobile canteens, fish and chip vans, excavators, ambulances, etc.	69 000	73 000	72 000	64 000	78 000	81 000
Steam propelled vehicles ※	-	-	-	-	-	-
Horse drawn vehicles	---	---	---	---	---	---
TOTAL +	---	---	---	---	---	---

\+ The numbers of licences of vehicles belonging to the armed services and the numbers of horse drawn vehicles are not readily available.

※ The numbers of vehicles were 311 229 172 161 100 86

≠ The number of tramcars in use.

--- Not available.

Table 4

NUMBERS OF FIRES PER THOUSAND LICENCES CURRENT

Outbreaks attended by Fire Brigades in Great Britain 1948-53

Type of vehicle	1948	1949	1950	1951	1952	1953
Electrically propelled vehicles						
Tramcars	21.2	29.8	39.1	35.1	33.0	28.3
Trolley buses	7.0	10.8	5.4	4.0	8.4	3.8
Other e.g. milk floats, delivery vans	2.1	2.9	2.6	2.8	3.8	3.2
Vehicles propelled by internal combustion engines						
Goods transport vehicles (including petrol and oil tankers)	1.8	2.1	2.1	2.0	2.0	1.9
Motor cycles	0.5	0.9	1.0	1.1	1.1	1.3
Fire Service vehicles	3.2	2.0	3.0	3.7	5.1	0.7
Armed services' vehicles	---	---	---	---	---	---
Private cars	0.6	0.7	0.8	0.8	0.9	0.9
Public service vehicles (taxis, buses and coaches)	3.2	2.6	1.8	2.2	2.1	2.2
Other vehicles; dumpers, tractors, invalid chairs, mobile canteens, fish and chip vans, excavators, ambulances, etc.	2.7	4.3	5.8	6.6	5.9	6.2
Steam propelled vehicles	35.4	52.4	69.7	24.8	120.0	58.1
Horse drawn vehicles	---	---	---	---	---	---
Average rate all vehicles+	1.0	1.3	1.3	1.3	1.4	1.3

--- Not available

\+ Excluding horse drawn vehicles and vehicles belonging to the armed services.

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FIRES IN

The numbers of outbreaks attended by [illegible] Brigades in Great Britain 1948-53

	1948		194		1950		1951		1952		1953	
	Total no. of fires	% of total	Total no of fires		Total no. of fires	% of total	Total no. of fires	% of total	Total no. of fires	% of total	Total no. of fires	% of total
ELECTRICALLY PROPELLED VEHICLES												
FIRES DUE TO FAULTS IN FIXED MECHANICAL OR ELECTRICAL EQUIPMENT												
Mechanical heat, sparks or hot metal	2	1	4		14	6	2	1	8	4	5	3
Electric motor	32	19	40		10	5	22	12	20	10	30	19
Faults in electric wire and cable	99	58	140		124	55	100	53	96	49	60	37
Faults in other electrical apparatus	30	17	24		56	25	62	33	48	25	60	38
FIRES DUE TO ACTS OF OCCUPANTS OF VEHICLES OR FROM SOURCES EXTERNAL TO THE VEHICLES												
Including smoking materials, hot ashes and miscellaneous causes	8	5	20		20	9	2	1	24	12	5	3
	171	100	228		224	100	188	100	196	100	160	100
VEHICLES PROPELLED BY INTERNAL COMBUSTION ENGINES												
FIRES DUE TO FAULTS IN FIXED MECHANICAL OR ELECTRICAL EQUIPMENT												
Mechanical heat and sparks	239	7	268		314	6	380	7	256	4	280	4
Oil or petrol engine	1 051	30	1 456		1 726	34	1 828	33	2 024	33	2 225	35
Faults in electric wire and cable	1 220	35	1 620		1 662	32	1 834	34	2 180	35	1 985	31
Faults in other electrical apparatus	78	2	100		174	3	146	3	204	3	350	6
FIRES DUE TO ACTS OF OCCUPANTS OF VEHICLES, COOKING, HEATING OR LIGHTING APPARATUS												
Smoking materials, matches	264	8	360		374	7	368	7	396	6	375	6
Ashes, soot	21	1	32		82	2	64	1	76	1	135	2
Oil lamps, stoves, etc. (including engine heater lamps)	39	1	52		68	1	46	1	60	1	75	1
Other causes, including fish frying ranges, spontaneous combustion, quick lime etc. ...	14	1	56		36	1	56	1	56	1	45	1
FIRES INVOLVING SOURCES OF IGNITION EXTERNAL TO THE VEHICLE												
Children playing with matches	121	4	136		110	2	136	2	144	2	125	2
Rubbish burning	14	-	28		34	1	24	-	44	1	40	1
Oil blow lamps, oxyacetylene apparatus	12	-	24		18	-	28	1	40	1	55	1
Other causes, e.g. fireworks, spontaneous combustion, sparks from locomotives	51	2	44		62	1	52	1	80	2	65	1
CAUSES NOT IN ABOVE GROUPS												
Miscellaneous and undefined	35	1	40		78	2	120	2	120	2	105	2
Unknown source of ignition	288	8	348		388	8	390	7	480	8	540	8
	3 447	100	4 564		5 126	100	5 482	100	5 160	100	6 400	100
HORSE DRAWN VEHICLES												
FIRES DUE TO ACTS OF OCCUPANTS OR COOKING AND HEATING APPARATUS IN VEHICLES												
Includes smoking materials, matches, hot ashes, oil lamps and stoves	25	54	28		14	28	50	58	20	26	5	8
FIRES INVOLVING SOURCES OF IGNITION EXTERNAL TO THE VEHICLE												
Includes children playing with matches, fireworks, oil blow lamps, etc.	15	33	20		32	64	24	28	36	48	45	75
CAUSES NOT IN ABOVE GROUPS												
Miscellaneous and undefined	3	6	-		-	-	10	12	-	-	5	8
Unknown source of ignition	3	7	4		4	8	2	2	20	26	5	9
	46	100	52		50	100	86	100	76	100	60	100

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Table 6

THE CAUSES OF FIRE IN VARIOUS CLASSES OF ROAD VEHICLES

Outbreaks attended by Fire Brigades in Great Britain 1952

Causes of fire	Goods vehicles		Motor cycles		Motor cars		Other vehicles	
	No.	Frequency per 1 000 licences	No.	Frequency per 1 000 licences	No.	Frequency per 1 000 licences	No.	Frequency per 1 000 licences
Electric wire and cable igniting - insulation	420	0.43	40	0.04	932	0.37	40	0.51
- oil or petrol	84	0.09	96	0.10	184	0.07	24	0.31
-other materials	88	0.09	4	-	136	0.05	4	0.05
Other electric apparatus igniting - insulation	8	0.01	-	-	20	0.01	-	-
- oil or petrol	24	0.02	16	0.02	20	0.01	12	0.15
-other materials	-	-	-	-	8	-	8	0.10
Electric battery igniting - insulation	12	0.01	-	-	28	0.01	-	-
- other materials .	20	0.02	8	0.01	12	-	-	-
Petrol engine igniting - oil or petrol	304	0.31	756	0.79	444	0.18	84	1.08
- textiles, paper	100	0.10	-	-	48	0.02	-	-
- other materials	68	0.07	28	0.03	72	0.03	4	0.05
Mechanical heat or sparks igniting - oil or petrol	72	0.07	4	-	-	-	-	-
- tyres	100	0.10	-	-	-	-	4	0.05
- other materials	24	0.02	-	-	4	-	-	-
Smoking materials igniting - contents	100	0.10	8	0.01	44	0.02	24	0.31
- seating	16	0.02	-	-	68	0.03	-	-
Naked lights or matches igniting - oil or petrol	36	0.04	8	0.01	24	0.01	16	0.21
-other materials	80	0.08	4	-	32	0.01	40	0.51
Engine heater lamps igniting - oil or petrol	8	0.01	-	-	16	0.01	-	-
- other items	-	-	-	-	12	-	4	0.05
Oil lamps	4	-	-	-	-	-	-	-
Sparks from [illegible]	12	0.01	8	0.01	12	-	4	0.05
[illegible]	3	0.04	-	-	-	-	-	-
Boilers	4	-	4	-	-	-	4	0.05
Calor gas ranges	-	-	-	-	-	-	12	0.15
Fish frying ranges	-	-	-	-	-	-	28	0.36
Oxyacetylene apparatus or blow lamps	16	0.02	-	-	4	-	12	0.15
Quick lime, spontaneous combustion	16	0.02	-	-	-	-	-	-
Fireworks	24	0.02	4	-	-	-	-	-
Miscellaneous causes	48	0.06	12	0.01	28	0.01	44	0.54
Unknown causes	134	0.16	52	0.05	184	0.08	44	0.54
	1 932	2.0	1 052	1.10	2 324	0.92	460	5.90

Table 7

THE DAMAGE CAUSED BY FIRES IN ROAD VEHICLES

Frequencies observed in random samples of reports of attendances by Fire Brigades in Great Britain 1952

Cause of fire	Category of damage						Total
	None or superficial		Moderate		Severe		
	No.	Per cent	No.	Per cent	No.	Per cent	No.
GOODS VEHICLES							
Electric wire and cable ...	18	56	6	19	8	25	32
Other electrical faults ...	12	70	2	12	3	18	17
Petrol engine	21	66	6	19	5	15	32
Mechanical heat and sparks	23	45	18	35	10	20	51
Smoking materials	11	69	1	6	4	25	16
Other causes	38	66	8	14	12	21	58
PRIVATE CARS							
Electric wire and cable ...	44	67	6	9	16	24	66
Other electrical faults ...	12	55	2	9	8	36	22
Petrol engine	19	58	6	18	8	24	33
Smoking materials	9	56	1	6	6	37	16
Other causes (including mechanical heat and sparks)	11	55	2	10	7	35	20

Table 8

THE AGE OF ROAD VEHICLES IN RELATION TO THE CAUSE OF FIRE

Frequencies observed in random samples of reports of attendances by Fire Brigades in Great Britain 1952

Age of the vehicle in 1952	Cause of fire								Total
	Electric wire and cable		Other electrical faults		Petrol engine and mechanical heat and sparks		Other causes (presumed to be independent of age)		
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	
PRIVATE CARS									
Under 10 years...	14	23	3	14	5	21	6	20	28
Ten years or more	48	77	18	86	19	79	24	80	109
	62	100	21	100	24	100	30	100	137
GOODS VEHICLES									
Under 10 years ..	16	55	7	44	57	76	37	60	117
Ten years or more	13	45	9	56	18	24	25	40	65
	29	100	16	100	75	100	62	100	182

Table 9 (i)

THE METHOD OF EXTINCTION OF FIRES IN ROAD VEHICLES

Fires attended by Fire Brigades in Great Britain during 1952 which were extinguished before the arrival of the Brigade

Frequencies estimated from a 1 in 4 random sample

Means of extinction	Type of vehicle					
	Goods vehicles		Motor cycles		Private cars	
	No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences
Hand extinguishers						
Carbon tetra-chloride	124	0.13	88	0.09	224	0.09
Foam	24	0.02	28	0.03	28	0.01
Soda acid	24	0.02	12	0.01	32	0.01
Type unknown or more than one type	28	0.03	4	-	24	0.01
Total	200	0.20	132	0.14	308	0.12
"First aid" methods						
Removal, beating, smothering, covering with earth	140	0.14	148	0.16	264	0.10
Buckets of water	92	0.09	64	0.07	104	0.04
Burnt-out	20	0.02	16	0.02	44	0.02
More than one of the above methods	32	0.03	32	0.03	40	0.02
Total	284	0.28	260	0.27	452	0.18
Garden hoses	12	0.01	-	-	12	-
Combinations of extinguisher and "first-aid" method ..	20	0.02	24	0.03	12	-
Method unknown	12	0.01	12	0.01	20	0.01
Total fires attended	528	0.54	428	0.45	804	0.32

Table 9 (ii)

THE METHOD OF EXTINCTION OF FIRES IN ROAD VEHICLES

Fires attended by Fire Brigades in Great Britain during 1952 which were not tackled before the arrival of the Fire Brigade

Frequencies estimated from a 1 in 4 random sample

Means of extinction	Type of vehicle					
	Goods vehicles		Motor cycles		Private cars	
	No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences
Hand extinguishers						
Carbon tetra-chloride	112	0.11	76	0.08	316	0.13
Other types, or more than one type	12	0.01	44	0.05	40	0.02
Total	124	0.13	120	0.13	356	0.14
"First-aid" methods such as removal, smothering, water from buckets, etc.	36	0.04	8	0.01	64	0.03
Hose reel jet (using water in tank only)	436	0.44	188	0.20	348	0.14
Hose reel jet (using more water than that in tank)	112	0.11	-	-	40	0.02
	548	0.55	188	0.20	388	0.16
Jets from a hydrant	20	0.02	4	-	8	-
Jets from pumps	64	0.06	12	0.01	32	0.01
	84	0.08	16	0.01	40	0.01
Combinations of above methods						
Hose reel jets and jets from pumps or hydrants	72	0.07	-	-	16	0.01
Extinguishers and hose reel jets	48	0.05	40	0.04	100	0.04
Other combinations	16	0.02	4	-	32	0.01
	136	0.14	44	0.05	148	0.06
Total fires attended	928	0.94	376	0.40	996	0.40

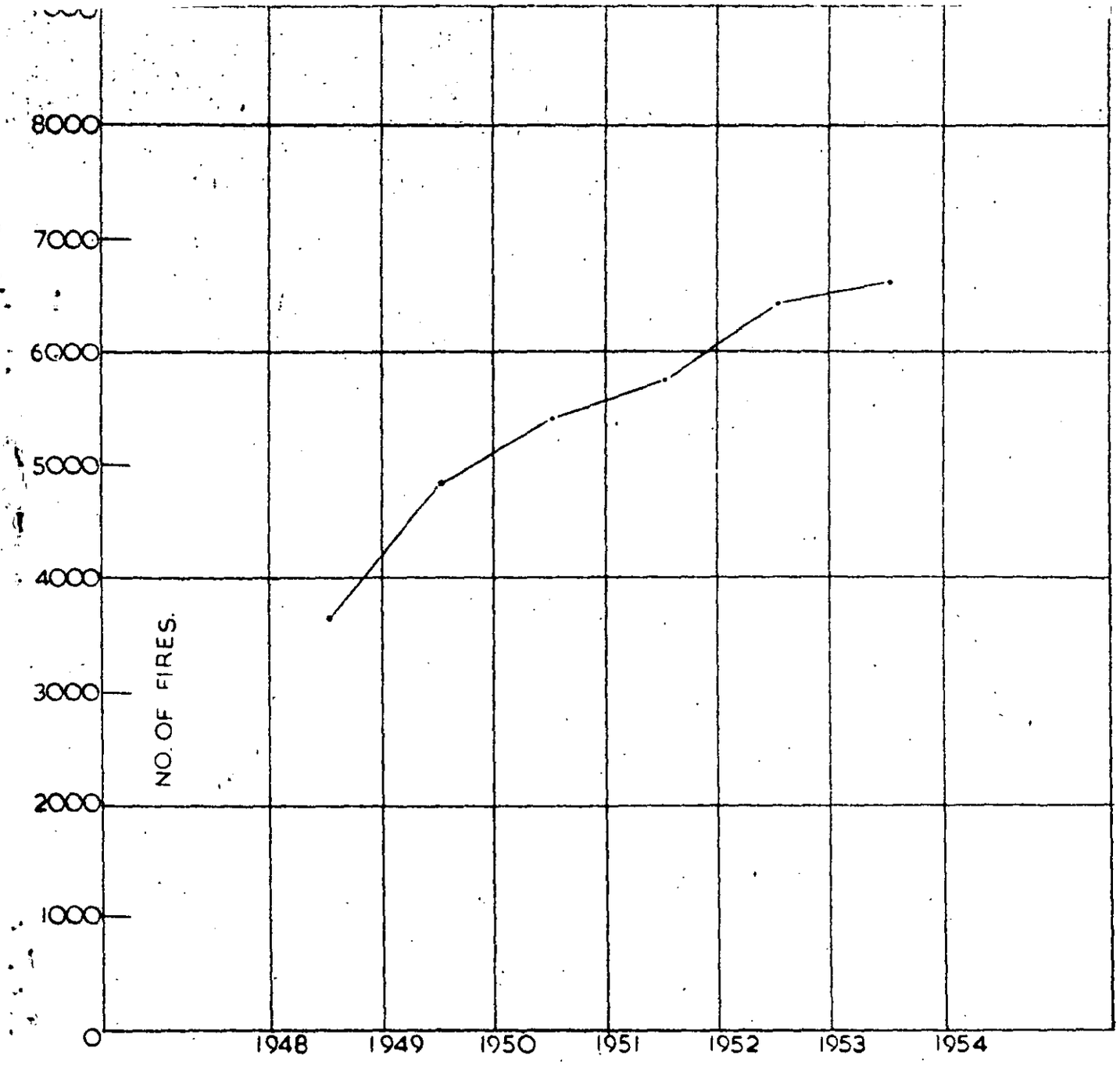
Table 9 (iii)

THE METHOD OF EXTINCTION OF FIRES IN ROAD VEHICLES

Fires attended by the Fire Brigades in Great Britain during 1952 which were tackled before the arrival of the Fire Brigade but were extinguished by the Fire Brigade

Frequencies estimated from a 1 in 4 random sample

Method used by Fire Brigade		Method used before arrival of Fire Brigade								Total	
		Hand extinguishers		"First-aid" methods		Garden hose		Combined methods			
		No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences	No. of fires	Frequency per 1 000 licences
Hand extinguishers	Goods vehicles	36	0.04	32	0.03	-	-	-	-	68	0.07
	Motor cycles	32	0.03	48	0.05	-	-	-	-	80	0.08
	Private cars	92	0.04	64	0.03	-	-	-	-	156	0.06
"First-aid" methods	Goods vehicles	44	0.04	28	0.03	-	-	-	-	72	0.07
	Motor cycles	12	0.01	12	0.01	-	-	-	-	24	0.03
	Private cars	48	0.02	60	0.02	-	-	4	-	112	0.04
Hose-reel jets	Goods vehicles	136	0.14	96	0.10	12	0.01	12	0.01	256	0.26
	Motor cycles	44	0.05	44	0.05	-	-	4	-	92	0.10
	Private cars	72	0.03	100	0.04	12	-	20	0.01	204	0.08
Jets from pumps or hydrants	Goods vehicles	4	-	12	0.01	-	-	8	0.01	24	0.02
	Motor cycles	-	-	4	-	-	-	-	-	4	-
	Private cars	12	-	8	-	-	-	-	-	20	0.01
Combinations of above methods	Goods vehicles	44	0.04	-	-	8	0.01	4	-	56	0.06
	Motor cycles	24	0.03	20	0.02	-	-	4	-	48	0.05
	Private cars	16	0.01	16	0.01	-	-	-	-	32	0.01
Total fires attended	Goods vehicles	264	0.27	168	0.17	20	0.02	24	0.02	476	0.48
	Motor cycles	112	0.12	128	0.13	-	-	8	0.01	248	0.26
	Private cars	240	0.10	248	0.10	12	-	24	0.01	524	0.21



•——— The numbers of outbreaks attended by Fire Brigades in Great Britain 1948 - 1953.

×——× Outbreaks of fires in road vehicles per 1,000 licences current.

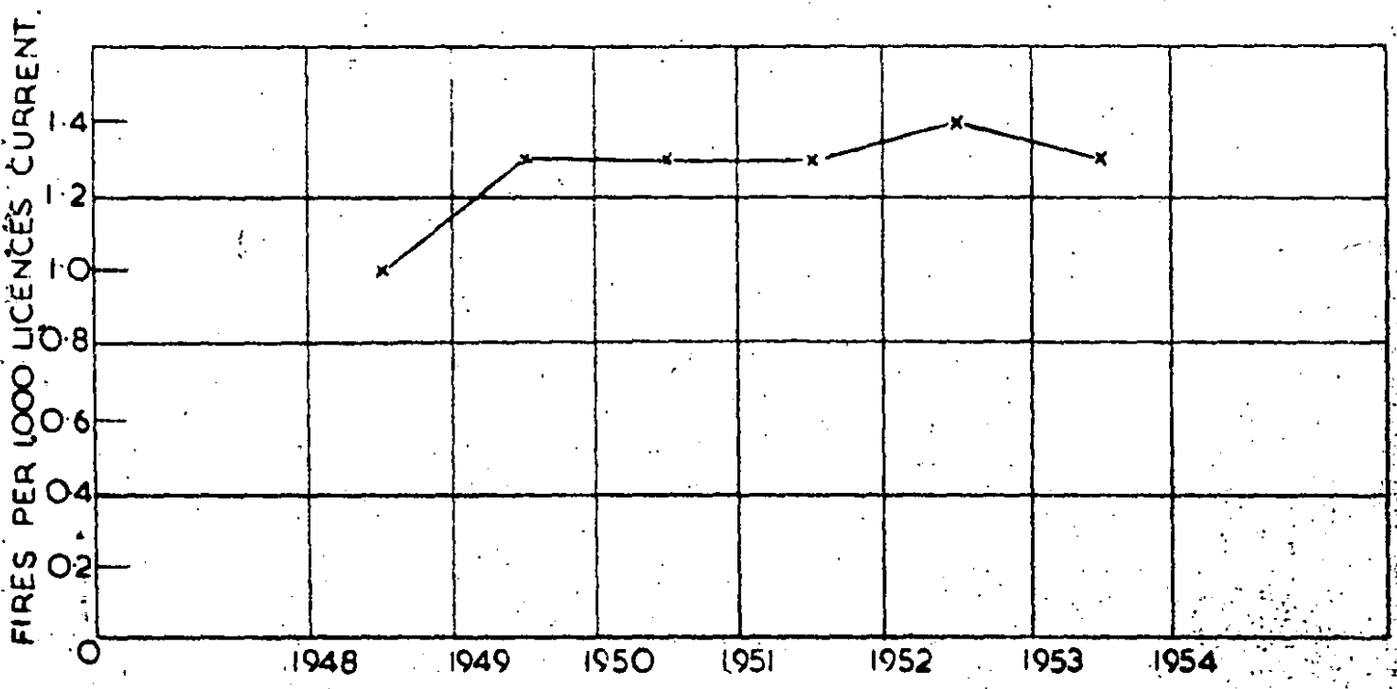


FIG. 1. FIRES IN ROAD VEHICLES