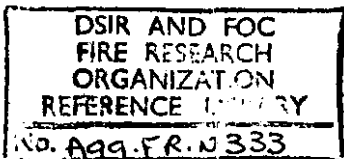


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FIRES CAUSED BY OIL BURNING APPLIANCES IN 1956

by

J.F. Fry and Mrs. J.E.L. Hinton

Summary

The annual incidence of fires caused by oil burning appliances of all types, other than blowlamps, has increased from 1 340 (2.2 fires per 1 000 tons kerosine sold in the home market) in 1947 to 3 412 (4.1 fires per 1 000 tons kerosine sold) in 1956.

In 1956 Fire Brigades in the United Kingdom attended 2 810 fires caused by oil burning appliances other than blowlamps and apparatus used in industrial processes. Of these 1 202 occurred in dwellings, 718 in premises used for agricultural purposes and the rearing of livestock and 301 in garages or parked vehicles.

In dwellings most of the fires were due to portable heating appliances. In 18.5 per cent of them the appliances were dropped or overturned (generally overturned) and in 21 per cent the apparatus "overheated" or "flared up".

The fires in agricultural premises were mainly caused by chicken brooder lamps and 60 per cent of them were ascribed to "overheating", "flaring-up", leakage or flooding.

In about 59 per cent of the fires in vehicles and garages, which were mainly due to heater lamps, the appliances had come into contact with combustible materials (frequently petrol vapour).

There were 36 fatal casualties in the fires reported, 32 of them being in dwellings.

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# FIRES CAUSED BY OIL BURNING APPLIANCES IN 1956

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## INTRODUCTION

It has been observed that during the last few years the annual incidence of fires caused by oil burning appliances has been increasing; in 1947 Fire Brigades in the United Kingdom attended 1 340 of these fires and by 1956 the number attended had risen to 3 412. Production figures supplied by the Board of Trade show that the increase in fire incidence has accompanied an increase in the annual sales of kerosine in the home market, but the increase in the incidence of fire due to oil burning appliances (other than blowlamps) has been rather larger than would be expected from the increase in the consumption of oil. The rate of incidence of fires due to oil burning appliances was 2.2 per 1 000 tons of kerosine in 1947, but has risen to 4.1 per 1 000 tons by 1956. Fig.1 shows graphs of total incidence and of the changing rate of incidence for the period 1947-56.

It is known that many new types of oil heating appliances have appeared on the market in the past few years and that there is a growing tendency to use these appliances domestically both as main and as supplementary sources of heat. These facts were brought to the notice of the Interdepartmental Committee on Accidents in the Home and it was decided to obtain further information by a study of Fire Brigade reports.

Reports of all fires caused by oil burning appliances (excluding blowlamps) attended by Fire Brigades in the United Kingdom during 1956 were examined but those concerning apparatus used in industrial processes were discarded.

## NUMBERS OF FIRES AND TYPES OF PREMISES IN WHICH THEY OCCURRED.

During the year, 2 810 reports of fires of the type covered by the analysis were received; 1 202 (43 per cent) of these occurred in private dwellings and 718 (27 per cent) in premises used for agricultural purposes and the rearing of livestock; 301 incidents occurred in garages containing vehicles, or vehicles parked on the road.

Table 1 shows the distribution of incidents according to the type of premises and the month in which the fire occurred. In all types of premises the peak incidence was in February.

## TYPES OF APPARATUS

The types of appliances involved in these incidents are shown in Table 2 for each of several categories of occupancy. It will be seen that in all types of premises the majority of incidents were caused by portable heating apparatus. In dwellings and commercial premises these were mainly portable space heaters; in agricultural premises they were mainly chicken brooder lamps; in garages and parked vehicles they were generally heater lamps placed near the vehicle engine or radiator.

## CAUSES OF FIRES

Table 3 shows the causes of fires attributed to oil burning appliances and indicates whether they appear to have been due to errors in usage or to faults in the appliance.

Many of the incidents, in all types of premises, were reported as being caused by "overheating", "flaring-up", "leakage" or "flooding"; this was so in about 60 per cent of the fires in agricultural premises. It was not usually possible to determine from the reports of these incidents how the appliance in question had overheated or flared up; in some cases the wick may have been turned too high or draught conditions may have been conducive to rapid burning, in others, especially where heater lamps were placed under cars, the appliance may have been overheated through burning in a confined space with little air circulation.

The proportions of incidents definitely attributable to errors in the usage of the appliances varied between 11 per cent in agricultural premises and 24 per cent in dwellings, the most common error being over-filling or spillage of fuel. In addition it should be noted that some of the incidents, over one-third in each group of premises, were due to accidental causes which could not be classified with certainty as errors of usage although in at least some of these the element of error in usage was probably quite large. Among the occurrences included in this group of unassigned faults were "accidental overturning" which may have been due to some action of the user or to instability of the appliance, and contact with combustible material which, in the case of chicken brooders, might be avoidable by care in design. About 59 per cent of the fires in vehicles and garages were due to contact with combustible material, a large proportion of them being attributable to petrol vapours coming into contact with heater lamps; in this group again there may have been some error on the part of the user although there may also have been some deficiency in the design of the apparatus which should make appropriate allowance for the use for which it was intended.

Although there were only 111 fires caused by fixed oil-heating apparatus among the reports examined, it is known that the use of this type of apparatus is increasing and it was thought desirable to examine these reports separately. The causes of fires due to fixed oil-heating apparatus are given in Table 4. The commonest reported cause, that of 23 per cent of the fires, was leakage of fuel.

#### BEHAVIOUR OF DIFFERENT TYPES OF PORTABLE OIL HEATERS

In 267 of the 1 075 reports of fires in dwellings attributed to portable oil heaters the oil heaters were identified by name so that it was possible to tell which were of the drip feed type and which of other types. To examine the possibility that the causes of fire might be different in the two groups of apparatus they have been separately tabulated in Table 5. It should be noted that the figures in Table 5 cannot be used as a basis for assessing the relative overall chance of fires being caused by the two groups since the reports containing names of appliances are unlikely to constitute a representative sample. The distribution of causes within the groups is, however, of interest.

It may be seen that the proportion of fires caused by the appliance being dropped or overturned, and the proportion due to contact with combustible materials, are both considerably lower among the drip-feed types than among other types. On the other hand the proportion of fires caused by leakage or flooding is greater among drip-feed types than among other types.

#### MATERIAL FIRST IGNITED AND EXTENT OF FIRE

Some details of the materials ignited and of the extent of the fire and heat damage in fires caused by oil burning appliances were given in the reports.

About two-thirds of the 1 439 fires occurring in dwellings, and in commercial and industrial premises, were confined to the room in which the fire started; about one-quarter involved the contents of the room only and caused no structural damage. In 16 (1.3 per cent) of the incidents in dwellings the fire involved the entire building and there were 7 incidents in which fire spread beyond the building in which it originated.

In agricultural premises and in garages and vehicles, because of the highly flammable nature of substances near the appliance, the proportion of fires in which the fire did not spread beyond the appliance was very small. In about two-thirds of the 718 incidents in agricultural premises the fire involved structural materials and livestock. Since in most cases the agricultural buildings concerned were sheds or light structures, it was inevitable that fires not detected immediately tended to result in the complete destruction of the structure and contents.

In 20 of the 301 incidents occurring in garages fire spread beyond the building in which it started.

#### CASUALTIES

The casualties resulting from fires caused by oil burning appliances are listed in Table 6. In the fires reported there were 36 fatal and 219 non-fatal

casualties. Thirty-two of the fatalities and 139 of the non-fatal casualties occurred in dwellings. Burns and shock were the most commonly occurring injuries amongst both the fatal and the non-fatal casualties but 12 of the fatalities were reported as being due to asphyxia.

#### DISCUSSION AND CONCLUSIONS

From the information given in many of the reports of fires caused by oil burning appliances it was not possible to decide whether the fire resulted from a defect in the apparatus or from careless usage. The most frequently occurring cause of fire in dwellings was "overheating" or "flaring up" of the apparatus. In these fires there may have been an element of carelessness or ignorance but, since it should be possible to leave an oil heater burning normally for long periods without attention, it seems not unreasonable to classify these incidents as being due to some defect in the appliances. The reasons for and mechanism of this phenomenon of overheating might well be the subject of further study.

Over 200 of the fires in dwellings were caused by heating appliances being dropped or overturned, mostly overturned. A number of the reports referred to accidental overturning by animals or children and from this it appears possible that the stability of some of the appliances is in question. There were also about 200 fires in dwellings caused by flammable materials coming into contact with heaters, and although careless usage was probably responsible for a number of these it was not possible to assign the cause positively or to tell to what extent the design of the apparatus contributed to the danger. There was a small number of incidents, mainly in dwellings, which resulted from the use of petrol instead of paraffin, sometimes by mistake but sometimes because there was no other fuel available. The danger of this procedure is obvious but apparently not always recognised.

Heating appliances using a drip-feed system in the fuel supply appear to be less likely than other types to be overturned or placed near combustible materials, but more likely to cause fires by flooding or leaking.

Of the 32 fatalities which occurred in dwellings due to fires caused by oil burning appliances, 17 resulted from incidents which followed the dropping or overturning of the appliances and the consequent ignition of furnishings and the contents of rooms; 9 of these deaths were from asphyxia. There were 9 fatalities due to the direct ignition of clothing being worn.

A disturbing feature of the fires due to oil burning appliances is that they caused about 6 per cent of the fatalities reported by Fire Brigades in the United Kingdom although they occurred in a group constituting only 2.4 per cent of the fires in buildings.

In a number of the incidents involving vehicles or garages it appears that petrol vapour was ignited by car heater lamps. Again it is possible that some of these fires resulted from misuse of the lamps and there may have been instances of the use of apparatus (e.g. hurricane lamps) not designed for the purpose. It does appear likely, however, that the construction of some of the heaters was at fault.

The fires in agricultural premises were mainly due to incubator brooder lamps and about 60 per cent of them were said to have been due to lamps overheating or flaring up. The function of a brooder lamp is such that it is almost invariably in close proximity to highly flammable material so that once uncontrolled burning occurs a fire will develop quickly, causing extensive damage to the building and loss of livestock. While no indication was given in the reports of the types of brooder lamps most frequently responsible for these fires, it is known from experiments carried out by the Organization<sup>(1)</sup>, that some heaters operate in a potentially dangerous condition which cannot be obviated by careful clean usage.

In the period 1947-56 the annual incidence of fires due to oil burning appliances has increased from 1 340 to 3 412. Some increase was almost inevitable since the use of this type of apparatus and the sale of appliances have increased considerably during this period. However, it is not merely the numbers of fires which have increased but also the rate of incidence in

terms of numbers of fires per 1 000 tons of kerosine delivered to the home market; in 1947 there were 2.2 fires per 1 000 tons of kerosine and in 1956 there were 4.1 fires.

REFERENCE

1. The fire hazard of paraffin heaters for chicken-brooders. Joint Fire Research Organization F.P.E. Note No.73/1951.

Table 1

## FIRES CAUSED BY OIL BURNING APPLIANCES CLASSIFIED BY THE TYPE OF PREMISES AND THE MONTH IN WHICH THEY OCCURRED

(Reports from Fire Brigades in the United Kingdom 1956)

Month of occurrence	Type of premises										Total
	Agricultural buildings	Dwellings	Caravans	Boats	Industrial buildings	Commercial buildings and offices	Educational establishments, public institutions, service premises	Clubs, hotels, restaurants, public houses	Vehicles and garages	Other and outdoor hazards	
January	74	127	9	4	11	24	6	7	51	15	328
February	162	321	4	2	27	30	15	10	100	34	705
March	124	118	6	3	8	13	5	4	33	27	341
April	122	62	4	-	11	3	5	1	5	12	225
May	91	43	1	-	8	3	2	1	2	29	180
June	32	24	1	4	3	2	1	1	1	6	75
July	19	22	3	2	3	1	-	-	4	4	58
August	10	26	2	2	3	3	2	-	2	10	60
September	12	30	2	3	7	1	-	-	5	14	74
October	11	72	4	1	2	4	6	2	9	8	119
November	23	172	1	2	21	18	10	7	51	15	320
December	38	185	6	4	10	21	4	4	38	15	325
TOTAL	718	1 202	43	27	114	123	56	37	301	189	2 810

Table 2

FIRES CAUSED BY OIL BURNING APPLIANCES CLASSIFIED BY  
THE TYPE AND USE OF THE APPLIANCE

(Reports from Fire Brigades in the United Kingdom 1956)

Type of appliance	Use or appliance				Total
	Heating	Cooking	Lighting	Mixed or unknown	
Agricultural buildings					
Fixed	11	-	-	-	11
Portable	682	3	21	1	707
Unknown	-	-	-	-	-
Total ...	693	3	21	1	718
Dwellings					
Fixed	30	6	-	-	36
Portable	1 075	25	42	3	1 145
Unknown	3	18	-	-	21
Total ...	1 108	49	42	3	1 202
Industrial buildings					
Fixed	29	4	-	-	33
Portable	56	5	16	-	77
Unknown	1	2	-	1	4
Total ...	86	11	16	1	114
Commercial buildings and offices					
Fixed	8	-	-	-	8
Portable	104	2	8	-	114
Unknown	-	1	-	-	1
Total ...	112	3	8	-	123
Vehicles and garages					
Fixed	6	1	-	-	7
Portable	253	3	36	1	293
Unknown	1	-	-	-	1
Total ...	260	4	36	1	301
Hazards other than specified					
Fixed	27	15	-	-	42
Portable	164	27	114	3	308
Unknown	1	1	-	-	2
Total ...	192	43	114	3	352
GRAND TOTAL	2 451	113	237	9	2 810

Table 3

FIRES DUE TO OIL BURNING APPLIANCES CLASSIFIED BY THE ACT OR DEFECT CAUSING THE FIRE

(Reports from Fire Brigades in the United Kingdom 1956)

	Act or defect causing fire										Total
	Children playing with or handling	Over-filled or fuel spilled	Over-turned or dropped	Too near combustible material	Filling while alight	Exploded	Over-heated or flared up	Leakage or flooding	Turned too high	Other or unknown	
Fault in appliance	-	5	2	3	-	14	834	180	-	99	1 137
Fault in usage	7	236	22	87	53	12	15	19	54	25	530
Both above faults	-	3	1	2	1	-	5	-	1	1	14
Not assignable and unknown	13	9	414	575	-	17	2	16	-	83	1 129
<b>TOTAL .....</b>	<b>20</b>	<b>253</b>	<b>439</b>	<b>667</b>	<b>54</b>	<b>43</b>	<b>856</b>	<b>215</b>	<b>55</b>	<b>208</b>	<b>2 810</b>



Table 4

FIRES DUE TO FIXED HEATING APPLIANCES CLASSIFIED BY THE CAUSE AND THE TYPE OF PREMISES  
IN WHICH THEY OCCURRED

(Reports from Fire Brigades in the United Kingdom 1956)

Act or defect causing fire	Type of premises						Total
	Agricultural premises	Dwellings	Industrial premises	Vehicles and garages	Commercial premises	Other and outdoor hazards	
Overfilled or fuel spilled	2	1	1	-	-	1	5
Combustible material placed too near	-	2	2	-	1	4	9
Exploded	-	2	3	-	-	-	5
Overheated	1	3	5	-	-	2	11
Leakage	2	8	6	1	2	7	26
Other or unknown	6	14	12	5	5	13	55
TOTAL .....	11	30	29	6	8	27	111

Table 5

## FIRES CAUSED BY PORTABLE OIL HEATERS IN DWELLINGS

(Reports from Fire Brigades in the United Kingdom 1956)

Act or defect causing fire	Portable type known to be drip feed		Other named portable types		All portable types	
	No.	%	No.	%	No.	%
Overfilled or fuel spilled ..	8	11.8	26	13.1	136	12.7
Children playing with or handling .....	-	-	-	-	2	0.2
Overturnd or dropped .....	6	8.8	40	20.1	200	18.6
Too near combustibile material	7	10.3	43	21.6	244	22.7
Filling while alight .....	3	4.4	6	3.0	29	2.7
Exploded .....	-	-	5	2.5	17	1.6
Overheated or flared up .....	17	25.0	45	22.6	246	22.9
Leakage or flooding .....	20	29.4	20	10.0	116	10.8
Turned too high .....	1	1.5	9	4.5	26	2.4
Other or unknown .....	6	8.8	5	2.5	59	5.5
TOTAL .....	68	100.0	199	100.0	1 075	100.0

Table 6

CASUALTIES OCCURRING AS A RESULT OF FIRES CAUSED BY OIL BURNING APPLIANCES  
CLASSIFIED BY NATURE OF INJURY AND TYPE OF PREMISES IN WHICH THEY  
OCCURRED

(Reports from Fire Brigades in the United Kingdom 1956)

Nature of Injury	Type of premises					
	Agricul- tural premises	Dwellings	Indus- trial premises	Commer- cial premises and offices	Garages and vehicles	Other and outdoor hazards
<u>Fatalities</u>						
Burns	-	18	-	-	-	4
Shock	-	1	-	-	-	-
Asphyxia	-	12	-	-	-	-
Other injuries	-	1	-	-	-	-
TOTAL .....	-	32	-	-	-	4
<u>Non-fatal casualties</u>						
Burns	3	114	11	9	24	27
Shock	-	13	-	-	-	-
Overcome by smoke	-	7	-	-	-	-
Other injuries	2	5	3	-	-	1
TOTAL .....	5	139	14	9	24	28

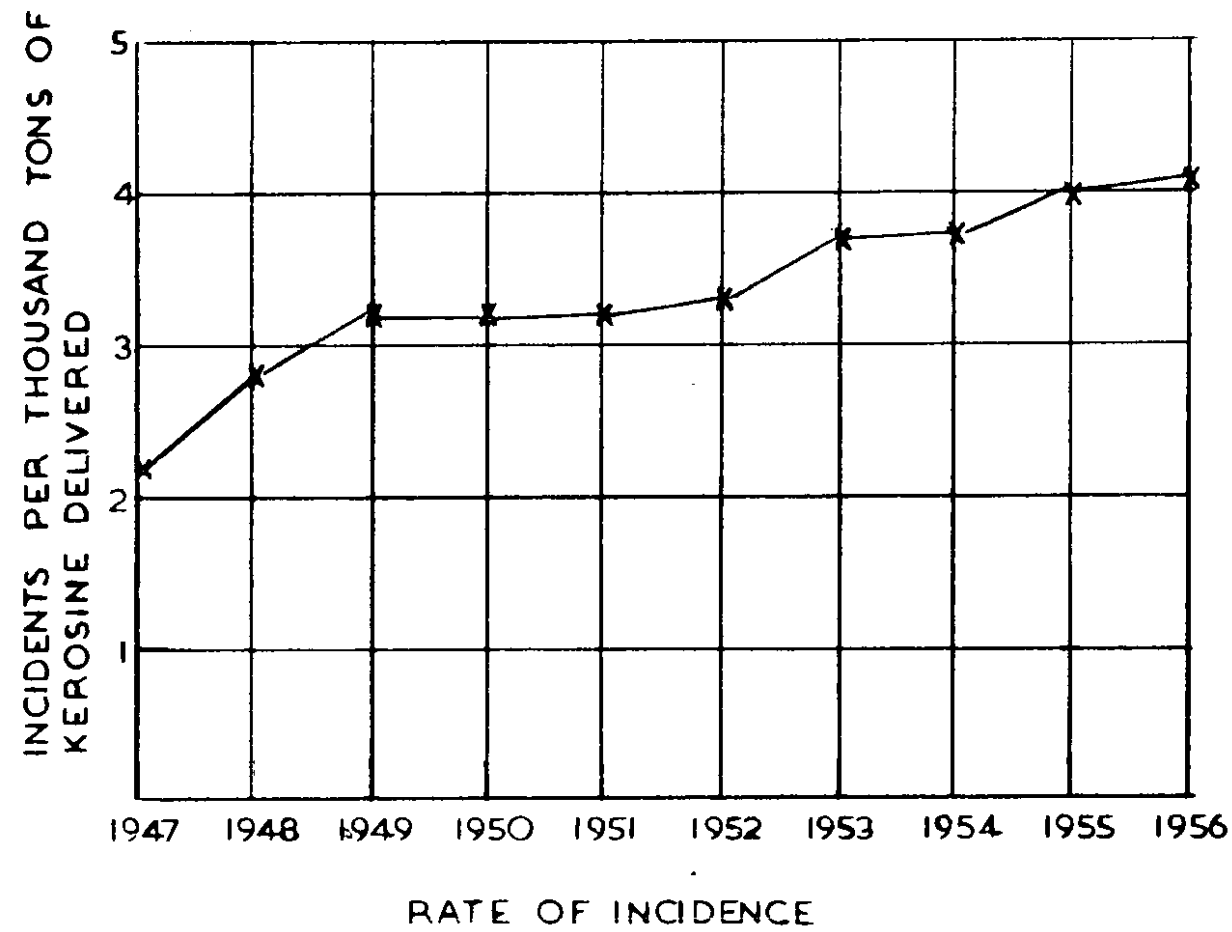
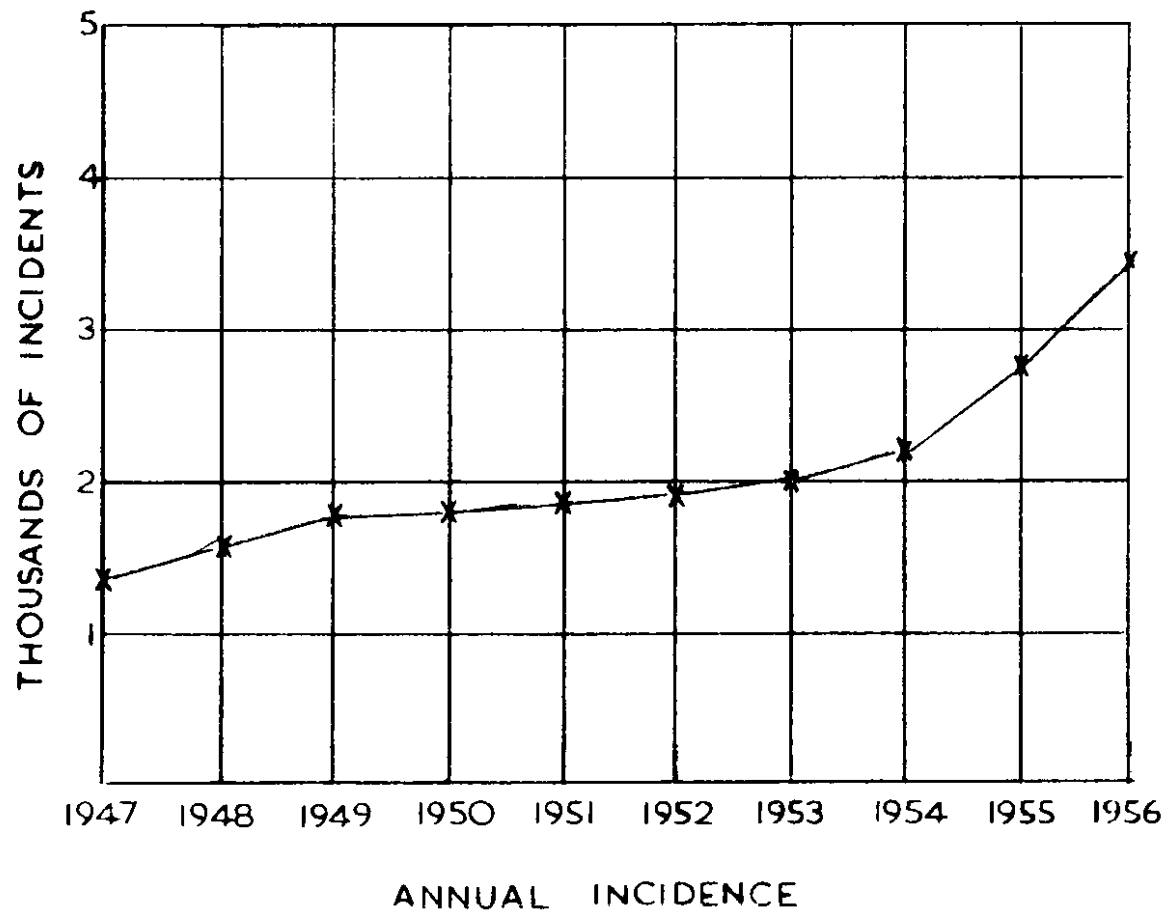


FIG. 1. THE INCIDENCE OF FIRES CAUSED BY OIL BURNING APPLIANCES IN THE UNITED KINGDOM 1947 - 1956