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AN ANALYSIS OF FIRES INVOLVING LIQUID FUEL GAS DURING THE YEARS 1947-1952.

REPORTS FROM THE N.F.S. AND FIRE BRIGADES IN THE UNITED KINGDOM 1947-1952.

by

J. E. L. Hinton

Summary

An analysis has been made of the reports of fires involving liquid fuel gas during 1952 and the results compared with those of previous analyses.

During 1952, 124 incidents were attended. In 83 incidents (67 per cent) the liquid fuel gas was the material first ignited giving a rate of 1.7 per 1,000 tons of gas sold, 52 of these fires were due to leakage of gas from cylinders and in about one-third of the incidents liquid fuel gas apparatus was the source of ignition.

There were 80 casualties, all non-fatal, reported in 1952; 77 of these occurred in incidents in which liquid fuel gas was the material first ignited.

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AN ANALYSIS OF FIRES INVOLVING LIQUID FUEL GAS DURING THE YEARS 1947-1952.

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Introduction

Reports of 124 fires involving liquid fuel gas during 1952 have been analysed and the results compared with a similar analysis for the five previous years.(1)

There have been 485 incidents during the six years 1947-1952. In 353 of these (73 per cent) liquid fuel gas was the material first ignited, and in 132 (27 per cent) liquid fuel gas apparatus caused ignition of other materials.

The term liquid fuel gas is used, as in previous notes to describe a group of gases consisting of propane, butane or mixtures of the two and known by various names such as Calor gas, propane, butane, Botto gas, Buta-gas and Pyro-gas.

1. Fires in which liquid fuel gas was the material first ignited

The frequency of fires in which the liquid fuel gas was the material first ignited is shown in Table I in relation to the hazard involved. There were 83 such incidents in 1952, 67 per cent of the total fires involving liquid fuel gas in that year. Thirtyfour of these occurred in private houses and flats and 18 in caravans.

Table II shows the frequency of incidents in which liquid fuel gas was the material first ignited in relation to the reported source of leakage of the gas. During 1952, 52 (66 per cent) of the incidents in which liquid fuel gas was ignited first were due to leakage from cylinders. All leakages reported from cylinders are assumed to be due to either a faulty valve or a faulty union. Fifteen incidents were due to leakages in connections between cylinders and gas jets. Seven incidents occurred while cylinders were being changed.

In Table III the frequency of fires in which liquid fuel gas was the material first ignited is analysed in relation to the sources of ignition. Liquid fuel gas apparatus was the source of ignition for about one-third of the fires during 1952.

Of the 52 fires in buildings 8 were serious (damaging more than 50 per cent of the building) and 31 (60 per cent) were confined to the room of origin. One incident, in an oil refinery, broke out in a liquid fuel gas filling and despatch department and spread by explosion to two other departments causing 13 non-fatal casualties (a similar incident occurred in 1951). There were 8 serious fires involving other hazards one of which, in a ship in dock, caused 10 non-fatal casualties. There were in all 77 non-fatal casualties reported in incidents in which liquid fuel gas was the material first ignited.

2. Fires in which materials other than liquid fuel gas were ignited first, the jet from the liquid fuel gas apparatus being the source of ignition

These incidents are analysed in relation to the hazard involved in Table IV. Twentytwo incidents occurred in buildings and 19 in other hazards. There were five serious fires due to such causes, four of which occurred in buildings.

Three casualties all non-fatal were caused by fires in which liquid fuel gas apparatus was the source of ignition of other materials.

3. Comparison with the results of previous analyses

During the six years 1947-1952 for which reports of fires involving liquid fuel gas have been examined, a total of 485 incidents were attended by Fire

Brigades, the number increasing each year from 35 in 1947 to 124 in 1952.

From figures of the sales of liquid fuel gas obtained from the Ministry of Fuel and Power it has been possible to calculate a rate of incidence by means of which a comparison between the incidence of fire in each year may be made. The incidents in which liquid fuel gas was itself the material first ignited have been used to calculate this rate of incidence since most of the remaining fires (those in which jets from liquid fuel gas apparatus was the source of ignition of other materials) could have occurred with any type of fuel. Between the years 1947 and 1951 this rate remained constant at about 2.2 per 1,000 tons of gas sold but the rate for 1952 was lower, being 1.7 per 1,000 tons of gas sold.

The average casualty rate has remained at 1 casualty per two incidents. Two hundred and sixteen casualties during the period covered were caused by 353 incidents in which liquid fuel gas was the material first ignited, whereas there were only 13 casualties in the 132 incidents in which liquid fuel gas apparatus ignited other materials.

Conclusions

There has been a considerable increase year by year in the sales of liquid fuel gas and presumably in the number of installations in use. The number of incidents reported has increased each year, but the rate of incidence remained approximately constant during the period 1947-1951 and decreased in 1952. This may indicate some reduction in the fire hazard due either to improvements in the design and fitting and servicing of the installations (2) or to increased awareness of the consumers of the precautions to be observed in using liquid fuel gas.

The casualty rate is high and has remained constant (at 1 casualty per 2 incidents) since 1947. An explanation of this may be found in the fact that the gas is under pressure in the cylinders and may therefore escape at a high rate even through small leaks in the apparatus. In addition leakages are less likely to be detected before ignition takes place than leakages of household gas since the odour of the liquid fuel gas although pronounced is not so obnoxious as that of coal gas and may not be so readily accepted as an indication of danger.

References

(1) D.W.MILLAR. Fires involving liquid fuel gas attended by the N.F.S. and Fire Brigades in the United Kingdom 1947-51. F.R. No.35 Oct.1952. Department of Scientific and Industrial Research and Fire Offices' Committee. Joint Fire Research Organization.

(2) T.H.TAYLOR. The Utilization of Liquefied Petroleum Gases. Journal of the Institute of Petroleum 1953. Vol. 39. No.353. p.255.

TABLE I

The frequency of fires in which liquid fuel gas was the material first ignited in relation to the hazard involved

Analysis of reports of fires attended by the N.F.S. and Fire Brigades in the United Kingdom 1947 - 52

Hazard involved	1947	1948	1949	1950	1951	1952	TOTAL
Buildings							
Private residential houses and flats	20	23	23	32	39	34	171
Canteens, coffee stalls, restaurants	-	3	2	1	2	5	13
Guest houses, hotels, public houses	1	2	-	-	-	1	4
Holiday huts	-	1	2	1	-	-	4
Farm buildings	-	-	-	1	-	2	3
Factories, workshops, stores, etc.	-	-	-	10	7	6	23
Other buildings	1	-	1	1	5	3	11
Hazards other than buildings							
Road vehicles							
Caravans	4	3	5	9	17	18	56
Canteens, coffee stalls, kitchens	1	6	2	8	5	6	28
Fish and chip vans	-	-	5	1	2	4	12
Other road vehicles	-	1	1	-	1	-	3
Craft on inland waters and in harbour, shipbreaking	1	5	3	3	3	1	16
Liquid fuel gas in the open at holiday camp	-	-	2	-	-	-	2
Factory yard	-	-	-	1	2	-	3
Miscellaneous	-	-	-	-	1	3	4
TOTAL	28	44	46	68	84	83	353

TABLE II

Frequency of fires in which liquid fuel gas was the material first ignited in relation to the reported source of leakage

Analysis of reports of fires attended by the N.F.S. and Fire Brigades in the United Kingdom 1947 - 52

(N.B.) Figures in brackets refer to the number of incidents in which cylinders were being changed

Reported source of leakage	1947	1948	1949	1950	1951	1952	TOTAL
Cylinder valve	4 (2)	5 (1)	10 (2)	7 (1)	12 (3)	13	51 (9)
Cylinder union	3	5 (1)	11	9 (1)	12 (1)	9 (1)	49 (4)
Cylinder	10 (4)	17 (4)	6 (1)	15 (3)	19 (2)	30 (5)	97 (19)
Connection, joint, pipe, tubing between cylinder and gas jet	6	9	15	24	20	15 (1)	89 (1)
Delayed ignition at liquid fuel gas ring	-	1	-	1	4	3	9
Unknown	5	7 (2)	4 (1)	12	16	9	53 (3)
Miscellaneous	-	-	-	-	1	4	5
TOTAL	28 (6)	44 (8)	46 (4)	68 (5)	84 (6)	83 (7)	353 (36)

TABLE III

The frequency of fires in which liquid fuel gas was the material first ignited in relation to the source of ignition

Analysis of reports of fires attended by the N.F.S. and Fire Brigades in the United Kingdom 1947 - 52

Source of ignition	1947	1948	1949	1950	1951	1952	TOTAL
Liquid fuel gas apparatus	6	16	17	20	34	27	120
Candle, cigarette, wax taper	1	3	2	1	3	1	11
Cooker, stove (fuel unspecified)	-	3	2	1	3	1	10
Electric fire	1	-	-	1	-	-	2
Fire in grate	7	3	3	4	4	7	28
Match	5	9	6	16	13	17	66
Oil lamp stove	-	2	-	3	6	2	13
Slow combustion stove	2	3	3	3	1	11	23
Miscellaneous	2	-	3	4	8	8	25
Unknown	4	5	10	15	12	9	55
TOTAL	28	44	46	68	84	83	353

TABLE IV

The frequency of fires in which materials other than liquid fuel gas were ignited first, the jet of the liquid fuel gas apparatus being the source of ignition, in relation to the hazard involved

Analysis of reports of fires attended by the N.F.S. and Fire Brigades in the United Kingdom 1947 - 52

Hazard involved	1947	1948	1949	1950	1951	1952	TOTAL
Buildings							
Private residential houses and flats	1	-	2	3	5	8	19
Canteens, coffee stalls, restaurants, confectioners	-	2	3	2	1	2	10
Factories, workshops	-	-	-	5	3	4	12
Farm and quarry buildings	1	2	-	-	-	-	3
Guest house, hotel, public house	-	-	-	-	2	1	3
Holiday huts	-	-	-	1	-	-	1
Other buildings	-	-	-	-	3	7	10
Hazards other than buildings							
Road vehicles							
Caravans	4	3	3	8	7	7	32
Canteens, coffee stalls, kitchens	-	2	-	1	5	4	12
Fish and chip vans	-	-	2	4	5	2	13
Other road vehicles	1	-	1	-	-	1	3
Craft in harbour, shipbreaking	-	-	-	2	2	4	8
Rail siding, scrap merchants yard, barrack yard	-	-	-	2	1	-	3
Wharf	-	1	-	-	-	-	1
Miscellaneous	-	-	-	-	1	1	2
TOTAL	7	10	11	28	35	41	132

TABLE V

The frequency of fires igniting contents and structure of the hazard involved in relation to the type of liquid fuel gas apparatus causing ignition

Analysis of reports of fires attended by the N.F.S. and Fire Brigades in the United Kingdom 1947 - 52

Type of liquid fuel gas apparatus	Number of fires igniting contents	structure	TOTAL
Cookers, stoves, rings	52	26	78
Fires, heaters, radiators	10	6	16
Lamps	2	-	2
Bakers prover plant	-	1	1
Iron	1	-	1
Liquid fuel gas burner	12	14	26
Miscellaneous	4	2	6
Unknown	1	1	2
TOTAL	82	50	132