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DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICERS' COMMITTEE
JOINT FIRE INVESTIGATION COMMITTEE

REPORT ON FIRE AT MRS. GIBB'S CHOCOLATE WORKS, JACKFIELD, WORCESTER
ON 17th OCTOBER, 1958

Introduction

I visited the scene of this fire, on Tuesday, October 21st, 1958, in company with Mr. G. Eastham, Chief Officer, Worcester Fire Brigade and his Fire Prevention Officer, Mr. G. P. Halfway. We were met by Mr. Garton, the works fire officer and later also discussed the fire with Mr. E. S. Young, the factory manager.

Description of fire

The fire occurred early on Friday morning, October 17th, in a large store building 250 ft x 500 ft, used for the storage of refined sugar and chocolate crumb used in the manufacture of chocolate confectionery. The walls, including partition walls (the latter not entirely imperforate) were of brick, but the roof was of wood and felt with some glass lights. A plan is given in the Fire Prevention Officer's report, together with a general account of the course of the fire which will not therefore be described here, in detail, except insofar as it is pertinent to the discussion of a possible cause.

The fire occurred in a stack of refined sugar. This stack was about 100 ft x 85 ft by 15 ft high, and had been built up in unit blocks about 8 x 10 bags, to a height of 20 bags; this stack had been laid down for several months. The store was practically sealed, the louvres in the roof were covered with felt and the building was maintained at a humidity of 55-60 per cent by adjustment of the heating which was by heated air (circulated over steam-heated coils by electric fans).

The fire appeared to have started near a stanchion, and as shown by the investigations of the Fire Prevention Officer, over most of the stack it did not penetrate more than 3-4 ft down from the top except at the probable source where the fire had penetrated some 6-7 ft down. At the stanchions there was a gap between the blocks of bags of up to 9 in. The spread of fire was almost entirely along the channels between the bags, so that in many cases a bag would be practically untouched except at the edges with much of its contents not melted or even coloured by the fire.

The fire was detected through the alarm connected in series with the pump maintaining the pressure in the sprinkler heads; the alarm was activated by six sprinkler heads being opened by the fire. The fire was therefore tackled in the early stages, and although the high concentration of smoke and fume made firefighting difficult, the effort was so far successful that the spread of fire over the roof was restricted to a small area, though in view of the nature of the stock, smoke and water drag was fairly heavy.

At this stage, however, it may be useful to outline the possible course of the fire assuming that cause to be as suggested. We know, from work recently carried out at the Fire Research Station, that fine dusts and textiles, such as jute sacks are easily ignited by a source of heat such as a hot wire or a cigarette and which will not initiate open flaming combustion. The spread of fire is very slow and not particularly noticeable in a large space such as a store. The spread will occur most readily where there is some access of air, such as in the channels between the bays. It may burst into open combustion if it reaches a point where the conditions are particularly favourable, e.g. where there is a strong air current, and it may be significant that the apparent seat of the fire was near a situation where the narrow gap between the stacks formed a natural chimney.

Under the conditions outlined above there may be many hours between the first ignition and the onset of a fierce fire, during which time no marked indications of fire would be observed, and the apparent seat of fire, and the point where flaming combustion begins may be remote from the primary source of ignition.

While there is no direct evidence that the fire under discussion occurred as described, the whole course of the fire and the appearance of the stack are consistent with this hypothesis, and in spite of the excellence of the security arrangements and general housekeeping, I think the most reasonable cause of the fire is an external one so that one must be prepared to assume some smouldering break in the normal precautions.

Further comments

It must first be said that in view of the extent of the stores, and the nature of the roof construction, the restriction of the fire to such a small area of the roof was a tribute to the precautions for alarm signals and the prompt attack on the fire. Without these one might have expected very rapid spread of fire over the roof, and combining with this the high fire-load and the low fire-resistance of unprotected steel stanchions the whole building would have been gutted and a complete ruin.

In view of this, and considering the monetary value of the stock, a fact which was impressed on me on several occasions, I suggest that some thought be given to improving the stores and storage procedures as soon as conditions permit - I fully appreciate the difficulties of obtaining storage space in these days. Most of these steps have already been recommended by the Fire Brigade and I concur fully in the measures suggested in the search report. I would like to suggest the possibility of sub-division of the stores and possible protection of the steelwork.

Conclusions

I consider the most probable cause of fire to be an external source, but I am not able to suggest exactly what this source could have been. The restricted spread of fire in view of the nature of the risk, represents a noteworthy achievement on the part of all those responsible both for the fire precautions and for the actual firefighting operations, but steps as already outlined by the Fire Brigade and in this report should be taken to see that the possibility of rapid uncheckered spread is made less likely.

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I should like to express my thanks to the chief officer,
(Mr. G. Astham), and Mr. Allfrey of the Croydon City and County
Fire Brigade for bringing this incident to our notice and their help
in the investigation, and also to Messrs. Juddbury's and Mr. Young and
Mr. Compton for their frank and helpful co-operation.

Cause of fire

It must be stated at the outset that it is impossible to be certain of the cause of fire; to a large extent it is a matter of proof by exclusion of all other possible alternatives.

1. Electricity or similar cause

There seemed no possibility of ignition by this cause; although there were some heavy cables near the stack I was informed that they were disconnected. The steam heating pipes were all well away from the stacks.

2. Spontaneous heating

It has been suggested that the cause of ignition was the spontaneous heating of the jute bags or some chocolate crush, left from earlier storage possibly initiated or accelerated by ingress of storm water some months ago as described in Mr. Falfrey's report; it was realized, of course, that refined sugar was not itself liable to spontaneous heating. I am of opinion that spontaneous heating may be excluded as a possible cause of the fire for the following reasons:-

1. The chocolate crush, when tested in a laboratory apparatus, showed no sign of spontaneous heating.

2. When I arrived at the works, the stack had been partially dismantled, I was therefore able to examine, as I did thoroughly, a cross-section of the stack at various levels. Apart from the burnt portions, there was no sign of deterioration of the jute fabric - it must be remembered that in view of the nature of the commodity all sacks were new and clean.

3. With the exception of the site of probable origin of the fire, the damage was confined to the upper portion of the stack. If water had leaked into the stack one would expect the greatest penetration of water near the bottom of the stack, and consequently the extent of microbiological action and heating would be greatest in this region, so that if the heating would eventually lead to ignition it should have occurred near the base of the stack. This is contrary to what was actually observed, and there was, in fact, no internal drainpipe near the suspected origin.

Static electricity

I have not been able to visualise the circumstances under which static electricity could have been generated and discharged so as to cause ignition, particularly in view of the relatively high humidity maintained in the store.

External source of ignition

By a process of exclusion of other possibilities, the chief of which are outlined above, I arrive at an external source as the most probable cause of ignition, in full awareness of substantial difficulties in accepting this possibility. It must be admitted that not only is there no proof of any source of ignition, but the security arrangements and general housekeeping are undoubtedly good, and it has been possible to check the movements of workers in the store prior to the fire.