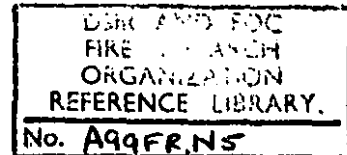


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DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE  
 JOINT FIRE RESEARCH ORGANIZATION

A DUST EXPLOSION AT MESSRS. THORLEY LTD., WANDSWORTH, MANUFACTURERS OF ANIMAL FEEDING STUFFS

by

K. N. Palmer

1. Introduction

The premises of Messrs. Thorley Ltd., Wandsworth, manufacturers of animal foodstuff cubes, were visited on 19th December 1951 as a dust explosion had occurred in one of their elevator ductings at 3.30 p.m. on the previous day. The building in which the explosion had taken place was examined in the company of the Manager, Mr. Burnett, and Mr. Dennett of London Fire Brigade.

2. Building and plant

The plant was contained in a four-storey brick building, with wooden floors, with similar blocks adjoining both sides as shown in fig. 1. The building contained few windows so that permanent electric lighting was necessary and the upper floors were reached by a staircase adjacent to one wall, access could also be obtained from adjoining buildings.

Ground (transit) floor: this was comparatively empty and was used mostly for loading and unloading, there was a lorry backed through the doorway at the time of the visit.

Grinding room: this contained two 'miracle' hammer mills (with cyclones) MM<sup>1</sup> which were fed by two kibblers KK<sup>1</sup> having magnetic separators; the kibblers broke up the cattle cake, as received, into fragments about 3 in. across. There were sacks of powdered cake lying about the floor.

Mixing room: this contained chiefly a pulley-driven worm mixer W which was fed by metal chutes C with ground provender from seventeen storage bins B. Molasses was added separately to the mixer from a small heap on the floor; there were also full and empty sacks strewn about the floor.

Top floor: the lower part of the room was taken up by the upper portions of the storage bins; above these was a plank landing La, reached by a ladder, which gave access to a system of pulleys etc. amidst the rafters. The wooden elevator casings E<sub>1</sub> and E<sub>2</sub> reached almost to the roof.

Processing: the cattle cake was initially broken into fragments, by the kibblers K, which were then passed up the elevator E<sub>1</sub> and fed into the metal hopper H (at rear); the elevator consisted of iron cups (6 in. x 3 in. x 3 in.) which were iron studded to a cotton belt and was enclosed by a wooden casing. The broken cake fell by gravity from the hopper, through metal ducting D<sub>1</sub>, into the mill M.

The powdered product then passed up elevator E<sub>2</sub> (similar to E<sub>1</sub>) and was fed into the storage bins B; from B it then fell through the metal chutes C into the mixer W after which it passed to a cubing machine in another building. This process was duplicated by kibbler K<sup>1</sup> and mill M<sup>1</sup>, the corresponding elevators are omitted from the figure.

### 3. Dust explosion

The explosion occurred when decorticated cotton seed cake was being milled and fed into the appropriate storage bin; the cake was in stock previously for about 5 months during which time its moisture content had risen from 7% to 10%. A workman in the mixing room saw a flash from the elevator casing E<sub>2</sub> which extended 20 ft after it was deflected into the room by an adjacent elevator casing from M<sup>1</sup>; the flame caused two sprinklers to operate. There was no sound detected above the general noise of the machinery and no subsequent flames, structural damage was superficial; the crack in the elevator casing through which the flash appeared was very small and was not visible 4 ft away. On seeing the flash the workman shut down the plant, which had been running continuously since 7 a.m., and patches of smouldering were found on the top two floors mostly around the elevator casing E<sub>2</sub>. Severe smouldering was found in the malt storage bin and slight smouldering in the 'returns' bin; none was found in other bins, including that containing decorticated cotton, although the sugar beet bin smelt of smouldering. The fire brigade extinguished all the apparent smouldering, but on checking twelve hours later a few further patches were discovered.

Production was back to normal at the time of the visit (2.30 p.m. 19.12.51); it seems probable that ignition took place in the mill M and flame subsequently travelled the whole length of the elevator ducting E<sub>2</sub>.

### 4. Previous incidents

The Manager stated that he knew of no earlier cases of fire, flashes, or smouldering on the premises; he had noticed sparks in the mill on several previous occasions but they had never led to ignition. The building had not been cleaned for a considerable time and it appeared that no attempts were made to collect dust.

### 5. Further points

The atmosphere was full of fine dust in the three upper rooms and layers of dust up to 1 in. in depth were spread evenly over all floors; the rafters were covered with layers of dust approximately 3 in. thick which were easily dislodged and showered into the room below, dust was also heaped into the corners of rooms. The Manager stated that these deposits, if collected, could be used again as "returns".

Apart from the magnetic separators in the kibblers no precautions were taken to prevent ignition in the mills and there were no vents in the elevator trunkings; no further precautions were taken after the explosion to prevent a re-occurrence.

Steel sheeting was laid along a gangway in the mixing room where hand trolleys were wheeled and it had become covered with dust; the gangway was lined in some places by sacks of powdered materials.

There were pulley systems on all floors, a workman being specially employed for oiling, and when it was necessary to idle a pulley the stationary belt was moved on to the rotating shaft.

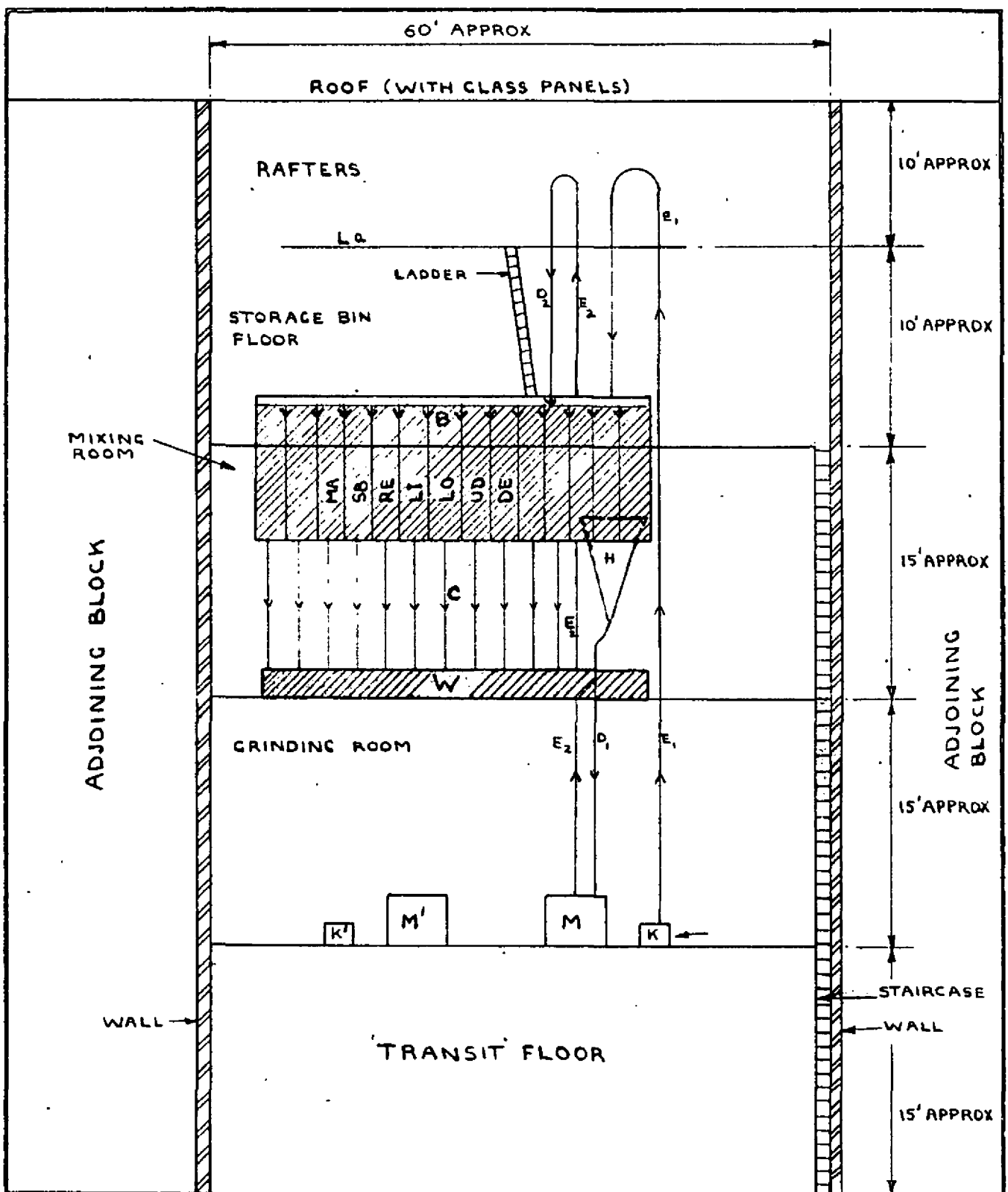
## 6. Conclusions

It is fortunate that the explosion did not have more serious consequences as there was sufficient loose fine dust in the building to produce a major explosion. Also, if the ignition had been confined to the elevator trunking the initiation of smouldering in the storage bins and on the upper floors might not have been noticed and could have led to a later outbreak when the premises were closed; a very rapid spread of flame throughout the building could then easily have occurred.

Great improvement in the standard of housekeeping could be made without difficulty; the fire hazard would be considerably reduced if dust were collected at regular intervals, moreover the dust so collected is usable as "returns".

## 7. Appendix

Samples of powdered decorticated cotton cake and powdered malt were obtained and in laboratory tests the former did not sustain smouldering. It is thus unlikely that smouldering played any intermediate part between ignition and the explosion in the elevator trunking. The sample of malt was obtained from that in the bin at the time of the explosion and it was found to sustain steady smouldering which advanced at 0.2 cm/min. It is possible that malt and "returns" are the only powders, of the seven marked in the figure, which support smouldering.



GROUND

KEY

- |                |                            |    |                       |
|----------------|----------------------------|----|-----------------------|
| LA             | PLANK LANDING              | B  | STORAGE BINS (17)     |
| KK'            | KIBBLERS                   | MA | MALT                  |
| E <sub>1</sub> | ELEVATOR FROM K            | SB | SUGAR BEET            |
| H              | METAL HOPPER               | RE | RETURNS               |
| D <sub>1</sub> | METAL DUCTING              | LI | LINSEED               |
| MM'            | "MIRACLE" MILLS & CYCLONES | LO | LOCUST                |
| E <sub>2</sub> | ELEVATOR FROM M            | UD | UNDECORTICATED COTTON |
| D <sub>2</sub> | WOODEN DUCTING             | DE | DECORTICATED COTTON   |
| C              | METAL CHUTES               |    |                       |
| W              | WORM MIXER                 |    |                       |

SECTIONAL ELEVATION OF BLOCK IN WHICH EXPLOSION OCCURRED