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PREVENT GRAIN DUST EXPLOSIONS AND FIRES

IT IS POSSIBLE—NECESSARY

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This Circular Tells How and Why

U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

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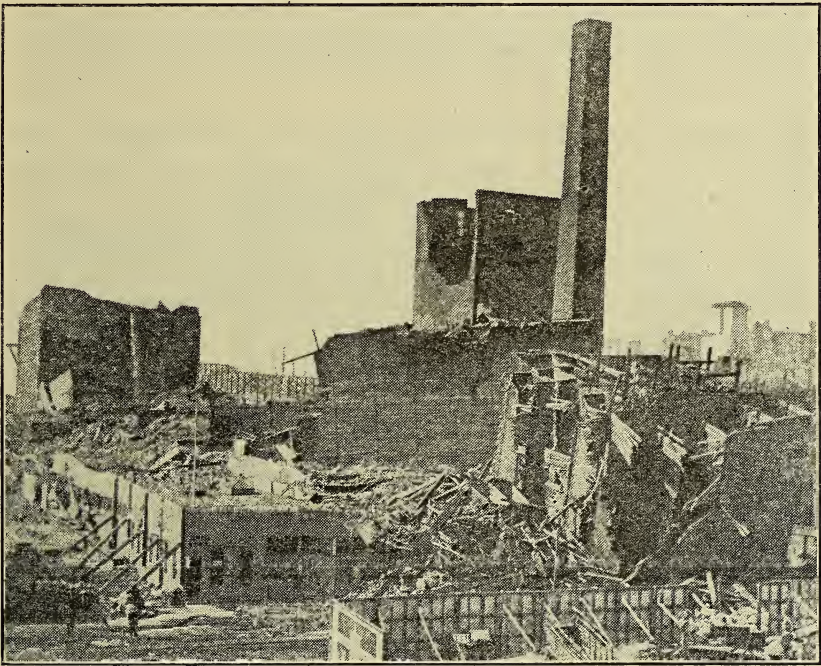
YOUR PLANT MAY BE NEXT

Did you know that—

Between March, 1916, and October, 1917, dust explosions caused the destruction of four of the largest grain and cereal plants in the United States and Canada?

In these disasters 24 people were killed, 38 were injured, and property to the extent of \$6,000,000 was damaged?

One of these was an explosion and elevator fire in which enough grain to supply bread rations for 200,000 soldiers for a year was destroyed?



During the same period of time a dust explosion occurred in a sugar factory, killing 12 persons, injuring 24 more, and destroying almost \$1,000,000 worth of foodstuffs and property.

And such disasters are occurring regularly. During the month of April, 1918, a carelessly dropped cigarette stub resulted in an explosion, and the consequent destruction of a warehouse with its surrounding property, a total loss of \$2,000,000. A few days later a flour mill, containing a great store of wheat, oats, and barley, was destroyed by a dust explosion, which at the time was ascribed to the use of a blow torch in the mill to babbitt a box.

HOW DUST DESTROYS

If you want to start a fire in a stove, you do not try to set fire to a large stick of wood with a match. Nor do you stop at splitting this stick into smaller pieces. To get a good crackling fire immediately, you reduce one of your big sticks to shavings, touch a match to it, and off it goes.

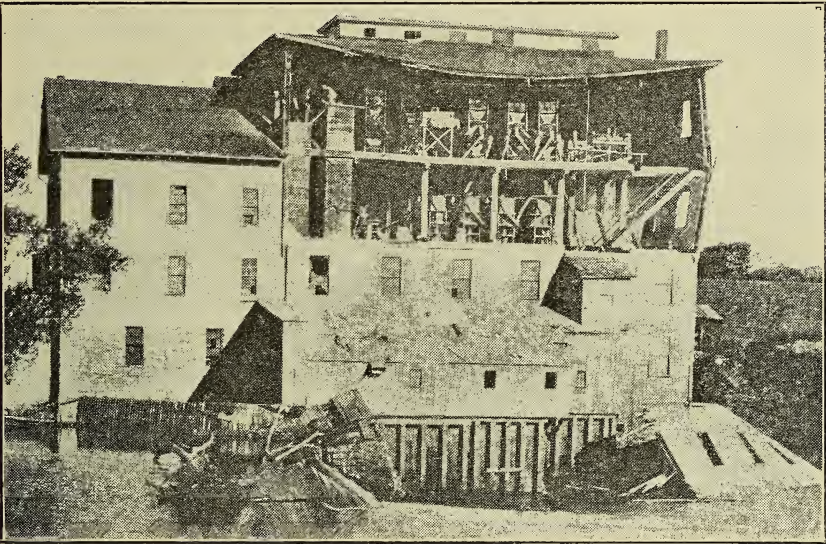
Now, suppose these shavings were ground to a coarse powder, spread out in a thin layer, and ignited. You would find that your powder would burn very rapidly.

If this powder were ground quite fine, and scattered about so that it became mixed with the air of the room, you could ignite it with a flame not even as large as that of a match. A very small electric spark, or a spark made by striking a piece of steel on a stone might cause this dust-laden air to take fire and burn so rapidly that it would produce an explosion.

And wood dust is not the only dust of which this is true. Almost any kind of dust containing carbon explodes under favorable conditions. Among such dusts are grain dusts, flour dusts, sugar dusts, rice dusts, feed dusts, paper dusts, cotton dusts, leather dusts, wood dusts, cork dusts, and fertilizer dusts.

WHAT SOME DUST CAN DO

A busy elevator or mill is usually a dusty place. Apparently dust and grain handling go hand in hand. But they do not always get along well together. For Dust is a treacherous companion. With the aid of its ally, Spark or Flame, it is eternally plotting to destroy property, valuable foodstuffs, and human lives. Here is what some of that dust did to one mill. After this disaster, a burned match was found in the bin where the explosion which destroyed the plant originated.



Dust and dirt in an elevator or mill are dangerous. A large amount of dust accumulating on beams, ledges, machines, window sills, and floors in an elevator or mill, if disturbed and thrown into the air, may result in an explosion, wrecking the entire plant.

WATCH YOUR PLANT

An elevator or mill which lacks proper provisions for the collection and disposal of grain dust is not a safe place in which to work and store our food. By observing the following ten rules, the danger from explosions and fires can be greatly reduced:

1. Get the dust.

It is easy for dust to escape from elevator legs, conveyors, spouts, bins, pits, and cleaning and grinding machinery. This dust settles on the floors, walls, beams, window sills, and ledges, watchfully awaiting its chance to bring destruction. In this condition it is no safer than so much gasoline or kerosene poured into these places, to be set off by any slight spark or flame from some unknown or unthought of source. Records show that six times as many fires occur among dirty mills and elevators as among clean ones.

While an absolutely dustless mill or elevator is almost an impossibility, the danger from dust can be greatly diminished if—

Floors, walls, beams, and ledges are kept free from accumulations of dust.

A complete and efficient dust collecting system is installed.

Dust houses and dust rooms are eliminated, and the dust sacked as fast as it is collected.

2. Prohibit smoking and carrying matches in or around mills or elevators.

Cigarettes, cigars, pipes, and matches have caused many dust explosions and fires.

3. Use no open flames, as gaslights, torches, lanterns, and candles, for any purpose whatsoever in or around a mill or elevator.

4. See that all wires for electric lighting are placed in conduits, and use only well-protected globes.

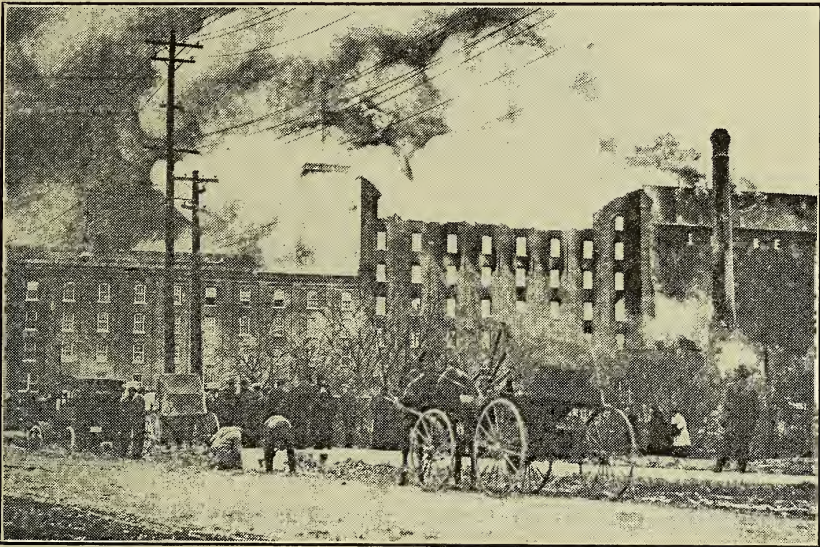
Sparks from motors, fuses, and switches are factors of great danger when the surrounding air happens to be dusty.

5. Do not lower artificial lights into bins to determine the amount of grain, flour or feed they contain.

It is much safer to use a weighted tape for this purpose.

6. Keep all foreign materials from entering the grinding machinery.

Bits of iron, steel, or stone often find their way into grain during handling. At the grinding plates of the mills they may create sparks which ignite the dust arising from the ground material in and around the machine. This produces a small explosion which propagates a more violent one, finally resulting in a fire and the complete destruction of the plant. This danger may be largely overcome by employing magnets or other devices to separate such foreign material from the grain before it enters the grinding machines. Fire following a dust explosion which apparently originated within the grinding machine destroyed this plant and its store of grain, a loss of \$2,000,000.

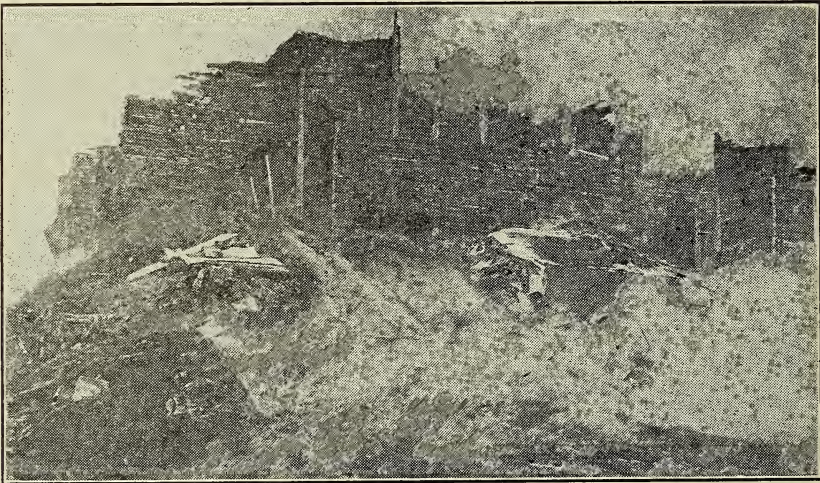


7. Eliminate static electricity.

Static electricity often is generated around grinding, cleaning, and other milling machinery, as well as by the friction of belts and pulleys. The result of this is a spark which may ignite the dusty atmosphere in and around the machine, and propagate a disastrous explosion. Static electricity and the dangerous sparks produced by it may be eliminated by properly grounding all metal and moving parts of the machinery, so that this electricity will be conducted away as fast as it is generated.

8. Look out for elevator choke-ups.

Some of the worst elevator explosions and fires on record have been caused by ordinary choke-ups, or the clogging of an elevator leg. The explanation is simple. The belt stops, but the pulley in the head continues to run. The friction between the belt and the pulley produces intense heat which finally causes the belt to burn, thus igniting the ever-present dust in the leg, which produces a short, sharp local explosion. This stirs up more dust; an explosion of greater volume and extent occurs; fire follows; and soon the entire plant is in flames. Here we see what happened to one elevator and the 750,000 bushels of grain it contained because a choke-up occurred in an elevator leg.



Overcome the dangers from choke-ups in elevators and conveyors by careful examinations at frequent intervals, and remedying immediately any slight rubbing, slipping, or other trouble.

9. Do not let elevator and conveyor belts rub.

The friction produced by the rubbing of elevator belts on the sides of the leg or head may cause a flame which will ignite the dust in the leg. The results bear a close resemblance to those due to a choke-up.

Very destructive explosions and fires are known to have been started in this way. Dust, always present in these elevator legs, ignites readily, propagating an explosion and fire which may quickly destroy the entire plant.

10. Sack the ground material immediately or convey it to bins of small capacity.

Sparks often originate inside the grinding machinery and attrition mills for various reasons. The resulting flame is transmitted through the conveyors to large dusty bins and rooms where a violent and destructive explosion occurs.

“SAFETY FIRST” IN A NUTSHELL

Let us not then, through sheer carelessness, continue to risk the loss of our elevators and mills, with their valuable stores of wheat, flour, and other food products, and the lives of the employees of these plants. Play safe by following these rules:

1. Construct the plant of fireproof materials.
2. Keep the plant clean and as free as possible from accumulations of dust.
3. Install an efficient dust collecting system.
4. Prevent the use and production of flames and sparks of any kind.
5. Prohibit smoking and carrying of matches.
6. Install some improved system of protection against fire.

The Bureau of Chemistry of the United States Department of Agriculture, Washington, D. C., stands ready to render all assistance in its power in preventing dust explosions in elevators, grain and flour mills, cereal mills, starch and sugar factories and all other plants subject to this danger. Do not hesitate to call upon the Bureau for any further information you may desire.

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