space. As grain dust is made up of finer particles, it is natural to conclude that a smaller quantity by weight would be required to create an explosive mixture.

The theory advanced at present is that dust explosions are caused by rapid propagation of flame from one particle to another with a speed that builds up heavy pressures. In the case of coal dust we have the formation of large volumes of highly heated gaseous products of combustion taking place in an infinitesimal period of time. The created gases occupy 2,600 times the volume of space taken up by the dust particles themselves. It is evident under these conditions that since the expansion is practically instantaneous, it must occur with explosive violence.

The rate of flame propagation has been measured. Gas explosions travel at the rate of 9,000 ft. per sec.; coal dust combustion at 6,600 ft. per sec.; and grain dust practically the same. The resulting unconfined pressure from coal and grain dust explosions, which has been fixed experimentally, plainly shows the impracticability of erecting structures that will stand up under such bursting pressures.

Dust explosions may occur singly or in pairs, and sometimes three distinct concussions have been felt. The initial explosion is usually of a minor nature. The first flame is propagated through the dust-laden air to a location where dust has been stirred into suspension and a greater volume of air is available. Here we have the subsequent explosion of greater violence and destructiveness.

How Explosions May Be Prevented

Precautionary measures have already been adopted for feed mills and grain elevator plants that tend to reduce the explosion hazard. In feed mills where grinding operations are going on continuously, and large quantities of dust are always in the air, great care should be exercised to prevent sparks from being created by the passage of foreign material through the grinding disks. The installation of magnetic separators to remove the metallic refuse, and proper cleaning devices to separate the mineral content, have been most beneficial.

The prevention of the flame propagation to the interior of the plant has been arrived at by the installation of a revolving damper in the discharge from the grinders to the elevator leg or screw conveyer taking care of the finished product. The machine section in front of the damper is vented to the outside air, and explosions taking place inside the grinder can then be safely discharged to atmosphere.

An air separation of foreign matter from raw grinder material is now being experimented with in several large feed mills. The principle of the grain trap has been adopted from the well-known dust-collecting system used in many elevators. The air current which is partially supplied by fan and partly created by suction from the grinder, is gauged to carry through into the feed box grain only, all the metallic and mineral content being removed during the sudden air expansion in the trap.

In grain elevators the danger from static electricity can be successfully coped with by grounding all elevator and conveyor head spouts. Friction of the grain passing over the steel spouting produces the static currents under these conditions.

The danger from belt slippage, hot bearings and leg choke-ups is one which can only be eliminated by greater vigilence on the part of the operating staff.

The use of vapor-proof lamp globes, replacing the old carbon types, should be universally adopted. The introduction of carbon filament lights into dusty grain bins has caused explosions. The dust coatings that always form on light globes throughout an elevator plant, in the case of the carbon types will heat to a very high temperature and often char. The sudden displacement of this heated coating to the dusty floor has caused explosions, but none have as yet been attributed to the modern mazda lamps.

It has been noted that in plants kept reasonably clean, explosions, when they do occur, have not the destructive powers they attain in others where no attempts have been made to remove the dust accumulations. It would appear from this fact that to prevent dust from discharging freely into the interior of a plant, would be the proper course to follow to reduce the explosion hazard.

The dust-collecting systems at present installed in modern houses could be easily improved upon to take care of this added feature. It is universally agreed that suction is the prime factor in dust removal; but suction requires power and therefore costs money. The ideal in grain elevator operation would be to provide suction at all points where grain is handled or thrown. This would prevent accumulation inside the plant and assist greatly in keeping a clean interior.

Government regulations at present do not provide an incentive to the elevator operator to keep dust out of his plant. Should an average allowance be made to the operator for dust removed from all incoming cars, based upon a loss in weight observed from a series of actual tests, which has already been determined at approximately 8 lbs. per car, and regulations requiring the installation of adequate dust-collecting and disposal systems be passed, then and only then will the operators move to improve existing conditions.

The existing allowances for invisible loss and shrinkage, as set forth in the provisions of the Canada Grain Act, 1912, and yearly tarriffs of the Board of Grain Commissioners for Canada, could be adjusted to take care of deduction for dust.

The order-in-council covering this regulation should set forth a standard suction pressure to be adopted and the distance of such suction openings from the grain in motion, and should also indicate the location of points of application. This would put the prevention of grain-dust explosions upon a working basis.

The regulations might at first be confined to elevators of medium and large capacity, with a reduction in the dust allowance as the grain passes from a shipping terminal to a receiving terminal where both have proper systems of dust elimination operating under government inspection. In this way, a car lot of a thousand bushels would lose 8 lbs. of dust at the lake-head terminal, and, say, 50% of this amount upon passing through the lower lake receiving houses.

The two outstanding factors that combine to cause dust explosions, namely, dust and some external source of ignition, which have in the past taken toll to the extent of scores of lives, millions of dollars' worth of food supplies, and untold property losses, are factors that can be eliminated by keeping plants clean and educating operating staffs to a knowledge of their responsibilities and the danger of carelessness.

BEATTY PLANT AT WELLAND PURCHASED

ANNOUNCEMENT has been made of the purchase by the Mead-Morrison Mfg. Co., East Boston, Mass., of the plant and business of M. Beatty & Sons, Ltd., Welland, Ont. The new firm will continue the business along the same lines as previously followed by this old-established Canadian firm, and it is said that the change in stock ownership will not involve any changes in policy.

In 1906 M. Beatty & Sons, Ltd., erected new reinforced concrete buildings on the Welland canal, and they now have large facilities for the manufacture of their present lines of electric hoists, hoisting engines, buckets, dredges, derricks, pumps, locomotive cranes, ditchers, steel scows, etc., but it is understood that the new owners of the plant will extend it and will manufacture coal-handling machinery and other lines.

The Mead-Morrison Mfg. Co. were established in the United States about 75 years ago, and besides their works and executive offices at East Boston, they have branches in New York and Chicago.

It is understood that Harvey L. Beatty will retire from the presidency of M. Beatty & Sons, Ltd., and Alvin O. Beatty from the vice-presidency, but that the following present officials will remain with the new organization: R. M. Beatty, superintendent; Geo. Day, secretary and sales manager; G. O. Norton, treasurer; and J. McCarter, purchasing agent.