

which the Court has awarded £250 damages. We think the rival office which accepted the transferred business under such circumstances is also to blame, but this is a matter for separate consideration. We observe that the Pearl Life Office have had one of their superintendents convicted for sending in fictitious proposals, and sentenced therefor, by the Lord Chief Justice, to nine months' imprisonment with hard labour. The *Royal Liver*, of Liverpool, have also been busy prosecuting some of their agents before the Bristol Court for forging death certificates with intent to defraud the society. The *Royal Liver* has been successful so far; the defendants, named Williams and Hunt, being (after a lengthened inquiry) committed for trial to the assizes on 3rd inst., bail being refused. These are simply a few examples of the every-day troubles of the industrial life manager, and clearly show that steps should be taken by them jointly in order to effectually prevent or withstand the numerous and varied forms of fraud in connection with this branch of business.

FLOUR MILLS AND INSURANCE.

(Continued from page 274.)

THE modern roller mill generally consists of three lofty buildings of six to eight floors, occupied respectively as warehouse, cleaning-house, and mill, and communicating with each other by irondoors or sluices in the party walls. The arrangements vary considerably in different establishments, but the following may betaken as a fair example of the processes usually carried on. The wheat, after being hoisted on to the first floor of warehouse, is passed down a shoot into a "separator" in the basement, which removes and carries the dust and dirt outside the building by means of a fan. The wheat is afterwards raised in elevators to the top floor, from whence it is delivered by vertical distributing shoots into the garner below. In the warehouse we are describing there are fifty-six of these garner, and the wheat can be directed to any one of these by means of valves worked from the top story. By similar means the wheat is drawn off as required, delivered on the ground floor, mixed in desired proportions, elevated once more to top of building, and shot into bins next the wheat-cleaning house. Passing under the iron slide in wall, the wheat enters an elevator in the cleaning house, is carried to top story, and descends in succession through the cleaning machines, which are arranged one above the other on the floors below. The first of these machines is a "separator" which removes barley, oats, and other foreign matters, and the wheat then passes over powerful magnets which arrest nails, pieces of wire, &c. The next machine (which is only used for certain wheats) is a "decorticator," consisting of three grindstones on one spindle, but rotating in separate troughs. After working its way through each of these the wheat, now freed from beard and loose dirt, enters the "smutter," where it receives another but less severe scrubbing, and is delivered to a powerful brush machine, in which it is passed in succession between four sets of fixed and revolving brushes. The cleaned wheat is afterwards elevated to top of building and shot into bins adjoining the mill. The dust from the cleaning operations is drawn by fans to dust room at top of building.

The wheat enters the mill by means of iron sluices in dividing wall, and after passing up an elevator and over a set of magnets, is delivered to an automatic weigher, and afterwards passes to a "grader," dividing into three sizes. It then enters the cockle cylinders, which remove the remaining foreign seeds. The grain is now ready for gradual reduction on the rollers on floor below. The "first break" consists in passing the wheat in two sizes through separate pairs of rollers, which are so arranged that the berry is split along the crease. In the "second break" each of the halves is divided into two or three pieces, and the reduction is continued through the third, fourth, and fifth breaks. After each break the product is elevated to the top story, and descends

the exhaust trunks and dust room. Since wire has come much into use for sheaving operations wheat—especially American wheat—is plentifully supplied with spark-kindling materials. We will take a single instance of a smut-room fire: the Hecker Mill fire in New York, in 1882. The evidence of the mill superintendent went to show that the fire originated in the "smutter" on seventh floor, and that the fire was caused by a spark, struck by friction in the smutter, igniting the dust and passing through the spout into the dust room, and there igniting the dust.

Coming finally to the mill, we find the most noteworthy sources of accident, under the old system, may be traced to the millstones running empty and striking fire, and to foreign substances introduced with the wheat, with a similar result. The flame, however found in the old mills had but little on which to feed until the introduction of the blast or exhaust, with dust room and connections. In estimating the relative danger from fire in new and old mills, we must constantly bear in mind that flour, in itself, is incom-bustible. Thrown on a glowing furnace it will retard, and if, in sufficient quantity, extinguish the fire. When mixed with air it burns slowly or freely according to the proportions; and given flour in a fine state of division mixed with air in proportions which are probably only attainable when the atmosphere has a certain density, a violently explosive mixture is the result. Illustrative of the first fact in this statement we give the following extract from the "Miller's Text-Book," written by a Practical Miller: "Strange enough, many millers think the quickest way of putting out a fire is by putting flour sweepings on it. In some mills where wheat and oats are ground, and where they sometimes grind the oat seeds, the stones have to be kept very close, and the feeding material being bad, the stone immediately fires—the seeds being a most inflammable material—when the quickest way of putting out the fire is by pitching flour sweepings on the top of the stone, when they soon smother it. As sometimes the flames were a great height before they could be got at, the first or second scoopful often burned up with a crackling sound at once, but not with what one would call an explosion. I have often seen a fire put out in this manner without the mill being stopped or the least disorder, where a few minutes' delay would have forced one to fly for his life." Returning to the millstones with exhaust, the reality of the danger of fire or explosion caused by a spark conveyed amongst the finely divided flour in the exhaust trunk has unfortunately been too often demonstrated to admit of doubt. The writer of a prize essay given in the *Millers' Journal* of New York a couple of years since states upon good authority that only about one-fifth of the explosion which occur are made public: the deduction being that millers not wishing to attract attention to the risk, make no mention of such accidents unless the damage is serious. On the other hand, as a means of keeping the mill clean and free from dust, the exhaust has much to commend itself both to the miller and the insurance company; but from the point of view of the latter it is an open question whether the advantages are not more than counter-balanced by the danger of its presence in the mill. Although usually likewise provided with an exhaust, the same danger is greatly modified in the roller mill; any foreign substance passing between the rollers would damage the machinery, and, on this account alone, the wheat must be carefully cleaned in the preliminary stages. The stive room is now happily dispensed with, however, in the best appointed mills, being replaced by dust collectors, of which there are several kinds now made, and which are all a great improvement on the former clumsy contrivance.

Having conceded so much in favour of the new system, we must be excused if on mounting to the upper stories of the mill we look with more uneasiness upon the purifiers, a large number of which are necessary. They are almost universally light wooden structures, with the internal machinery often revolving at a good speed, and provided with fan attachments to carry off the dust from each to the dust room. The number of fans is not a favourable feature in a mill. The reels and silk dressing machines come

through "scalping reels," which remove any flour that has been made, and on to sizing machines, which retain the smaller particles, sending down the larger pieces and the bran by means of spouts to the next pair of rollers. Any loose bran is removed by means of an aspirator attached to the hopper of each roller mill. The bran passing from last "grader" is elevated to a bran duster on top story, where it is cleaned and packed in sacks. The broken wheat or "semolina" is now collected from the graders according to size, and passes through centrifugal purifiers on another floor. In these it is divided into different qualities according to its specific gravity, the heaviest being used for the best flour. An inward current of air in the purifiers carries off the particles of bran by means of a trunk into a special dust room over the cleaning house. Any adherent bran is afterwards removed from the semolinas by smooth rolls with light pressure. After the flour has been dusted out, the semolina, together with the finer varieties gathered from scalping reels, is re-sized and again purified, the heaviest particles after reduction on smooth rolls and dressing on centrifugal dressing machine producing the patent flour. The next heaviest is made into bakers' flour, and the remainder, after undergoing further manipulation, produces flour of lower qualities.

We have dwelt somewhat at length on the new processes, chiefly to illustrate the important position which the elevator holds in the modern mill. It will be seen that in the warehouse the wheat twice travels from the basement to the top story of the lofty building; it is also twice elevated through the floors of the cleaning house. In the mill, during the five breaks, it passes through a succession of five elevators from the ground to the top floor, descending each time through the machinery and shoots; and besides these there are seven other elevators used in the subsequent processes. Then we have innumerable conveyors, spouts, and exhaust trunks, to say nothing of openings in the floors such as trap doors and shaft-holes, which all lend their assistance to make the mill an easy prey to the flames. It will be readily imagined with what lightning-like rapidity a fire could spread from floor to floor, and how poor are the chances of arresting the flames when once they have gained a hold on the structure. But in addition to the grave charge of aiding and abetting the spread of fire, the elevators (and the conveyors in a minor degree) have been arraigned as the actual incendiaries of many mills. The danger appears to consist in the pulley in the elevator head grinding against the side or on the strut board, and causing sparks to be deposited amongst the accumulations of flour and other dust with which the elevator head is usually well provided. The conveyors from the reels and dressing machines are liable to get choked up, and the discharge spouts are often placed inside the chest out of sight and not easily accessible. Mr. H. B. Horton, in a valuable paper communicated to the Pennsylvania Millers' Association, (extracts from which will be found in a recent issue) lays special stress on the danger from these two sources. The elevators are, however, much too useful to be ruthlessly banished from the mill; they are in fact practically inseparable from the modern system of milling. Many plans have been suggested to minimise the danger from their use by constructing them of fireproof materials, and some few mills have been fitted with patent tubing composed of galvanised iron, with cast-iron head and foot boxes; but as far as we can learn no substitute for the wooden elevator has been found to answer the purpose sufficiently well to warrant its general application.

After thus characterising the general structure of the mill, let us proceed to examine the machinery in the different departments. That in the warehouse calls for little remark; there the danger is comparatively minimum. Taking the cleaning house next in order, we find that it is here many of the fires originate. The machinery, consisting of brushes and cylinders, revolves at a high speed, and much heat is generated. Further, any foreign substance escaping the magnets is liable to cause fire or explosion by sending sparks along with the dust in a finely-divided state into