

requirement is not appreciated by many boiler-owners, but its necessity is illustrated by this explosion, where the material hidden by the concrete wasted from  $\frac{1}{8}$  in. to  $\frac{3}{8}$  in. in the short period of seven years.

An explosion occurred in May, 1933, from the barrel of a loco-type boiler of a traction engine used in Canterbury for agricultural purposes. The barrel was  $26\frac{1}{2}$  in. in diameter and 57 in. long, and the longitudinal seam was lap-jointed and double-riveted. The barrel was completely stripped of lagging in November, 1932, so that the joint could be thoroughly examined under an hydraulic test. Although the test was satisfactory and a careful inspection did not reveal any defect, yet six months later the barrel ripped without warning along the longitudinal seam, fortunately without causing injury to any person. Examination of the plate revealed that the explosion was due to a lap-seam crack which on the hidden side of the plate extended practically the full length of the barrel. During the explosion the crack opened up on the outside of the plate for a distance of 36 in. Rivets were cut out of the joint, and the workmanship was found to be satisfactory. Extensive laboratory tests of the defective plate failed to reveal any clear cause of the lap-seam crack. Owing to the numerous failures of lap seams in the shells of boilers in New Zealand during the past few years, the land-boiler rules were amended in 1931 to provide that no riveted longitudinal seam of a shell subject to internal pressure shall be of lap construction where the diameter of the shell exceeds 36 in. or the working pressure exceeds 100 lb. per square inch. This rule, of course, applies to new construction only. It is not possible to alter existing boilers to comply with the requirements of the rule. Very particular attention is given by Inspectors to all lap-jointed longitudinal seams.

#### MACHINERY.

The number of machinery inspections for the year amounted to 26,025, an increase of 1,466 over the previous year. The new lifts installed number 24, and 15 cranes were inspected for the first time.

Seven fatal accidents and thirty-three non-fatal accidents were reported during the year, as against nine and fifty respectively reported during the previous year. The circumstances of every accident were fully investigated by the Department's officers and where possible additional safeguards were fitted to reduce the risk of a recurrence of similar accidents. Brief summaries taken from the reports of the fatal accidents are as follows:—

(1) An owner of sawmilling machinery was ripping timber with a breast-bench circular saw when a piece of heavy timber was thrown back over the saw and struck him on the head with fatal results. The machinery had been reported idle and was not certificated. The accident was due to insufficient guarding at the back of the saw. This type of accident was formerly very common, and the Department has for some years past required that every breast-bench saw shall be equipped with a curved fin guard or riving knife which shall completely guard the back of the saw. Sketches of approved types of these guards have been freely distributed among owners of sawmilling machinery, and since the adoption of the curved fin guard accidents at breast-bench saws have been infrequent. It is unfortunate that the victim of this accident started working his mill without advising the Department and receiving the benefit of the Department's experience with regard to breast-bench saws.

(2) A boy nine years of age was visiting his father, who was night-shift engine-driver at a wood-working factory, when his clothes became entangled with the end of a revolving shaft. He received injuries from which he died almost instantly. The machinery was under trial and the potential danger of a shaft of this description had not been realized by the management of the factory. The end of the shaft which projected 10 in. beyond a bearing has since been cut off and the shafting efficiently fenced.

(3) A workman engaged in painting a wall of a dairy factory was caught by the end of a revolving shaft situated some 10 ft. from the floor and received fatal injuries. This is the class of accident which can be prevented by educational methods rather than by mechanical safeguarding. The victim was not concerned with the machinery, and should not have been instructed to work near a shaft while it was in motion.

(4) A drag-line used for obtaining gravel from the Rangitikei River had been hauled tight for the transport of three men across the river in the drag-line bucket. The line failed and precipitated the men into the river below. One man was pinned beneath the bucket and was injured and drowned. Investigations into the cause of the accident showed that the suspension rope had withdrawn from a socket attaching it to an anchorage on the far side of the river. The socket was not of satisfactory dimensions, nor had the best practice been adopted in socketing the rope. The socketing of wire ropes is covered by a British Standards Specification, and copies of the specification have been promulgated for the information of the Inspecting Staff and those concerned with the attachment of wire rope.

(5) An operator of a continuous-running power press in a leather-working factory inadvertently crushed a portion of his index finger between the die and press. The accident was not thought to be a serious one, but unfortunately tetanus developed and the victim died. The fitting of a safe and efficient guard for the protection of the operators' fingers to this class of machine is a difficult matter, and is now receiving the close attention of the Department. Many power presses are fitted with a pedal, the movement of which controls the operation of the press, but the careless or accidental tripping of the pedal is the cause of many accidents, and it is clear from the Department's experience that pedal control is by no means the solution of the problem.