bonus earnings to be made for less output than under piecework, thus creating greater incentive to less expert operators to earn bonus. It also permits greater tolerance to the rate-setter in setting rates, which factor in practice is a very necessary one where continued changes in patterns and small orders are to be contended with.

Concluding this section, I wish to point out that a study of the foregoing by the factory-manager with his principal foreman and men should be made first of all. The co-operation of all concerned is a valuable factor if it can be obtained voluntarily. The reduction of labour costs to be attained should easily reach 10 per cent.; more likely it will by proper co-ordinated effort reach 20 per cent. In New Zealand the objective is not to reduce staff, but to capture the market now in the hands of those who have already adopted similar methods to those contained in the foregoing.

APPENDIX E.

REPORT ON DETAIL STUDY INTO FACTORY BUILDINGS, MACHINERY, LAYOUT, AND ORGANIZATION.

By E. T. SPIDY.

Before going into details it is necessary to state that this detail study has been made chiefly in a factory which was classed as being among the best and most modern in New Zealand at the present time. As stated in the report, we came to recognize "modern and up-to-date" factories, grading down to those classified as "congested and poor" from the point of view of machinery, layout, &c. It obviously serves a useful purpose for only the "best" to be analysed, if any deduction therefrom is to have value in stating the position in New Zealand.

In making an analysis of a factory in all its details it becomes necessary first to pull it to pieces, as it were, for the purpose of analysis, and then to reconstruct it, so as to show that there is some advantage gained by so doing. All changes involve expense to some degree, and before any factory-manager can be expected to spend money he requires to be convinced he will get an adequate return for his expenditure. I am pleased to add here that at the factories that I have dealt with in this connection every assistance has been given me in all cases, and I feel assured that good results will in due course repay the time expended.

Factory Buildings, Machinery, and Layouts.

Dealing with factory buildings, machinery, and layout, in the first place an analysis of the whole actual processes employed requires to be made. Plans of each department were prepared, and all equipment and accessory machinery laid in to scale in its present position. Following this, routing diagrams were prepared to enable the sequence of operations on each of the different classes of shoes produced to be followed. These routing diagrams were then traced on the layout of each department, so that the course each order actually took was clearly indicated. It will be understood that these actual plans cannot be produced, as they represent the intimate details of factory departments of individual factories. They have, however, been studied by the official members of the Committee and the factory-managers concerned can vouch for their accuracy. The deductions from all the plans made showed that in all cases layouts could be improved.

Following this, new plans were prepared showing all machinery and equipment in rearranged sequence, giving the minimum movement of shoe-racks between operations. In a factory making shoes under several different processes (as the majority of New Zealand factories do) it becomes necessary to plan the layout to suit all the processes, in order to avoid duplication of machinery and in order to get the maximum use of each machine. These plans were completed with the assistance of the factory-manager and his staff, and resulted in a revised and satisfactory rearrangement.

With regard to buildings, it has to be taken into account when analysing any industry that ideal conditions would almost invariably demand a new building. This, for economic reasons, is almost impossible to get. Therefore, outside of extremely impossible conditions, the problem of increasing the efficiency of any factory lies in using existing buildings, or in improving them to the best possible utility and advantage.

From the various factories inspected, and the type that is mostly concerned in the majority of the shoe output of New Zealand, I am of the opinion that layouts can be improved without great expense, and with comparatively no building-changes expense. I commend the study of layouts to New Zealand manufacturers as being one on which considerable savings can be brought about.

Machinery.

With respect to the machinery employed on each operation, no attempt was made to carry the study beyond—

(1) Its relation to other machines in process:
(2) Position of operator in relation to the work:
(3) The time actually required to perform the operation:
(4) Its classification as to the amount of skill required to operate the machine efficiently:
(5) Its condition from maintenance viewpoint.

Since all the machinery employed is especially designed for its particular operation, questions of suitability are determined by the manufacturers own process, and by the condition of the old machine