tenance of the business. When conditions are such that it becomes impracticable to maintain any part of the indirect organization intact, it can be reduced as under any other type of management, and the effects of the reduction more accurately estimated. Under scientific management this reduction, if found necessary, can be made more intelligently and more fairly to those affected.

11. A reduction in the indirect force, however, should be considered only as a last resort. Before dispensing with the services of any of the more valuable members of the indirect force one must take into consideration the following:

a. The necessity of better planning to overcome the resistance to business;

b. The necessity for leadership and more intensive supervision in order to avoid unnecessary losses in operating;

c. The ability when times pick up of being able to take advantage of the pick-up against keen competition;

d. The possibility of a permanent impairment of investment in the loss of trained personnel of the organization;

e. The possibility of the loss of that other most valuable asset—morale.

12. In conclusion, one need take only the history of the organizations which are run under true scientific management as compared with those run under other types of management in order to find the answer. During these times of industrial depression and stress such as the world has never seen, the organizations whose management can be called truly scientific have come through, and are prepared as are no other organizations in their respective industries for the better times to come. In fact it can be pointed out that these organizations have contributed materially to the mitigation of the stress of the times and to the early restoration of normal business.

13. The large proportion of administrative or indirect expense to direct expense as commonly viewed, therefore, is no criterion of either economy in costs or efficiency in organization. At least eighty per cent of the time we have normal or good times. And management must build with the primary object of doing business effectively at such times. Good management, however, must look ahead and should be prepared for all contingencies. It should make plans for financial reserves to be used during times of depression and should conserve its resources in every other way. This should be done primarily by the building up of business on a basis of service. Business run with a view to service must at all times be based on economies in organization and economies in operation in order to render real service. This is the best preventive of the cutting of wages and the laying off of employees which is so universally practiced during times of depression and results in nothing of constructive value; on the contrary it produces bitterness. The efficiency needed for the maintenance of business as a service is the object of scientific management. Scientific management at all times organizes for the best possible service based on the elimination of both waste in human effort and waste in other forms, and for the proper control of all elements in industry making for the best efficiency and a fair return to all concerned at all times.

PRODUCTION COSTS AND SELLING PRICE DURING A DEPRESSION[1]

By Wallace Clark[2]

THE duties and responsibility of the man in general control of a business have been so well covered by recent addresses before the Taylor Society that there is little more to be said. I merely want to bring up one thing which is on the general manager's mind at present. He is not asking, "How can we increase our profits?" but he is asking, "How can we reduce our losses?"

If the industrial engineer is to be of any help in the general control of a business, he must be able to answer the latter question.

In a period of declining or dull business, there are in every manufacturing plant certain expenditures which must go on no matter how few orders there are. The only way to avoid these expenditures is to sell out and in these days that means giving the plant away. If the business is not sold out, it is obvious that the buildings and equipment of every kind must be kept in such condition that they will not deteriorate. If any work at all is to be done, a skeleton organization must be kept in the shop—the superintendent, foremen, inspectors, truckmen, watchmen and so on. The manager usually tries every other way out before he gives up the nucleus of his working force because he knows it will be easier to erect new buildings and buy new machines than to rebuild his organization.

[1] A discussion at a meeting of the Taylor Society, New York, December 3, 1921.

[2] Consulting Engineer, New York.

For the sake of simplicity, let us take a one-product plant such as a foundry or, better still, a drop forge shop which makes forgings for other companies. The manager has ceased to buy any steel except what is required for actual orders in hand. If he has had sufficient money or credit, he has made the repairs or improvements to his hammers, furnaces and buildings, a maintenance he had not had time to take care of when the shop was full of work. Let us suppose that all this has been done, that he is down to his skeleton organization, and that he has not even enough orders in his plant to keep these men busy. He is losing a good deal of money each month. What is his next step? How is he going to reduce his losses?

The manager has, of course, attempted all along to keep up his sales. He has been unusually careful of the quality of his forgings, has met all delivery promises, has increased his advertising and sent out more salesmen. The only remaining way to increase sales is by a considerable reduction in price. It is natural for him to shrink from this course, and before he takes it he wants to know how far he can reduce prices without increasing his losses.

There are certain expenses which must go on if the shop is kept ready for work: the interest on the investment in land, buildings and equipment, depreciation, taxes, insurance, repairs and the salaries of his skeleton organization. The shop must be provided with light, heat, water and compressed air. All these expenses go on whether there is work or not; they are due to keeping the shop ready for work and are not increased or decreased by the acceptance of an order. It is therefore clear that these overhead expenses or losses will not be increased by the acceptance of an order at a price which does not cover any of his overhead.

However, the acceptance of an order for forgings will cause certain other expenses. Steel must be bought or drawn from stores; one or more hammer men must be hired; power must be used for the hammers, although this additional expense for power will be small, for insurance regulations usually require that steam be kept up for the operation of fire protection apparatus. Fuel must also be used in the forges. These expenses are caused by the acceptance of any specific order and the price must, therefore, cover such expenses—that is, the cost of material, direct labor, some power for the hammers and fuel for the furnaces—for if the price does not cover those out-of-pocket expenses, the acceptance of that order will increase the losses.

Going back to the question "How far can prices be reduced without increasing losses?" the answer is: *"To a point which covers the cost of material, direct labor, power and fuel, but which does not cover any part of the overhead."*

In other words, it is possible to sell below cost without increasing losses. When I speak of selling at this material-labor-power-fuel cost without loss of money, I do not mean to say that that is the real *cost* of the forgings, for it is not. A portion of the overhead of the department and plant has been used in the production of the forgings and must, therefore, be charged into their cost. However, we are talking of reducing losses rather than making profits, which of course, must be based on costs.

Since we have found how low prices can be quoted without increasing losses, the next question is, "What prices should be quoted to reduce losses?"

Knowing that he has nothing to lose until he reaches the material-labor-power-fuel cost, the manager begins to lower his quotations and keeps on until he gets the orders. It is not likely that he will have to go as low as the point mentioned. When he does reach the level at which he can secure orders, how long should he continue to quote those prices?

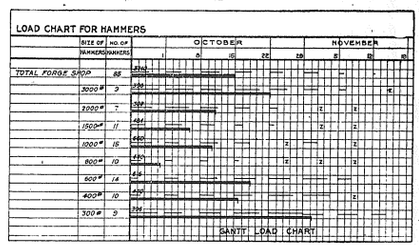

Figure 1

To make this clear, let me tell you how we worked it out in one drop forging plant.

The reason for quoting low prices was the small amount of work in the plant, and it was evident that the prices should fluctuate as the work ahead fluctuated (Figure 1). This is a Gantt Layout Chart on which the work ahead of the hammers was shown. Looking at the second line of the chart, there were nine 3000 lb. hammers in the shop and in a 44 hour week their capacity was 396 hours. They had work assigned to them which would keep them busy 80 per cent of the time as shown by the light line. It was the same the