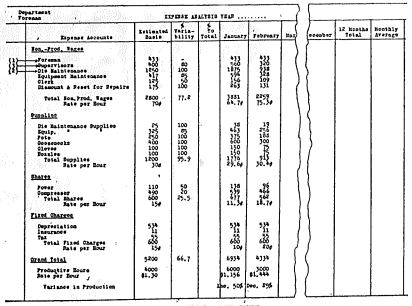

Figure 2

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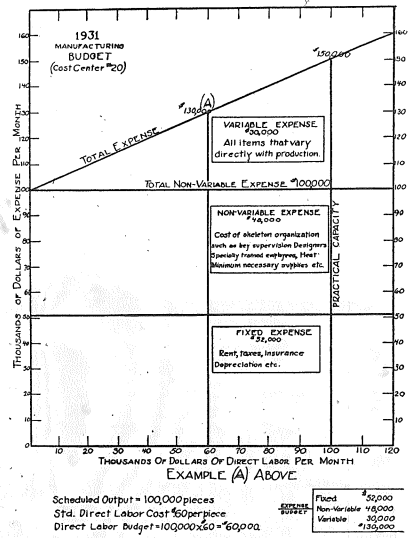

Figure 3

4. *Knoeppel Profitgraph.* I do not need to tell you about this example. It has been thoroughly discussed by Mr. Knoeppel himself in *Factory and Industrial Management* and has received wide publicity since. We have his original chart illustrated in Figure 4. This is an application of the cross-over chart to the problem of fixed and variable costs with volume of sales.

5. *Hyperbolic Unit-Cost Charts.* Sometimes it is better to show variation in terms of unit costs. This can be done conveniently by the use of semi-hyperbolic costing paper. (Figure 5.)

The horizontal scale is so ruled that by bisecting the distance from any point to the extreme right of the paper, the location of the point of twice that value will be obtained. Thus the distance (A) from 10 to 20 is equal to the distance (A') from 20 to the right edge of the sheet, and similarly the distance (B) from 25 to 50 is equal to the distance (B') from 50 to the right hand edge of the sheet. Therefore, if this process of bisecting is repeated indefinitely, we would approach but never reach the right edge. Therefore, that point may be labeled infinity. The vertical scale of this paper is a simple arithmetic scale, as the illustration will show.

Now, if cost figures for varying production are plotted on this paper with cost on the vertical or arithmetic scale and production on the horizontal or hyperbolic scale, the result will be a straight line. This will be true regardless of the nature of the item, as will be brought out presently.

It is not necessary to use specially ruled paper, however, as is shown by the lower part of Figure 8. The same result may be accomplished by plotting the cost per unit with the reciprocal of the production on a reversed arithmetiic scale. For example, the point (30) on the hyperbolic scale is the same as its reciprocal (.033) plotted on the reciprocal scale.

Simple examples of the application of this idea are found in Figures 6, 7 and 8. Figure 6 shows the curve for a fixed charge plotted on an arithmetic scale in the chart above and on a hyperbolic scale in the chart below. In this case, the result on the hyperbolic scale is a straight line passing through the unit cost for the production indicated on the extreme left and zero at the extreme right; since, if production is increased indefinitely, the unit cost for an item of fixed charge will approach zero.

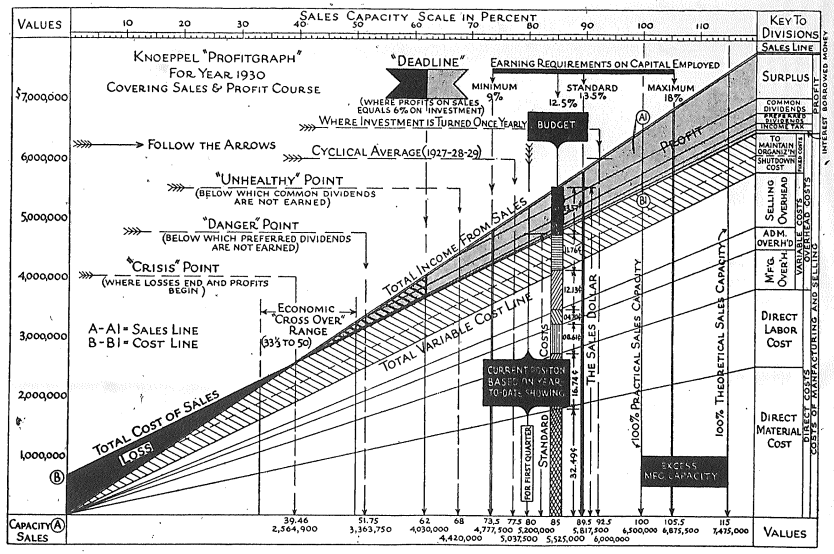

Figure 4

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In Figure 7 we have the other extreme case; namely, that of an item which varies directly with production. In this case, the unit cost will be the same regardless of production and will be represented by a straight horizontal line on either ruling.

Figure 8 shows the comparison for an item that is partly variable and partly fixed. This type of item gives a straight line which crosses the right edge of the sheet at a point which represents the cost for the variable item alone, the fixed portion of the item having been reduced to zero by indefinitely increasing production of the goods in question.

It can be seen from the above that any item or combination of items of cost will result in a straight line if plotted against production on hyperbolic paper. The greater the percentage of fixed items, the steeper will be the slope of the line. One point, however, must be borne in mind. The curve will have significance only up to the capacity of the equipment upon which it is based.

These examples that I have mentioned serve to indicate the great variety of procedures that may be used to present the accounts of a company in convenient form for budgeting. I believe, however, that those accountants who have resorted to graphical representation of the relationship between revenue and expenditures for different volumes of business are more successful in showing management the exact effect on the profit and loss statement of variations in volume of business and how to combat some of the troubles due to this cause. The method to use in illustrating this phenomenon, of course, will depend upon the particular problem involved, and no general rules can be laid down as to the best way for doing this.

Let us now pass to the second phase of budgetary control, namely, the reporting periodically of the relationship between the budgeted expenditures and the actual cost. If we examine the early literature on this subject, we find that most of the