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SCIENTIFIC MANAGEMENT
AS APPLIED TO
A SOUTH AFRICAN SWEET FACTORY.

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PART 1.

INTRODUCTION.

CHAPTER 1.

THE IMPORTANCE AND RAMIFICATIONS OF THE SWEET INDUSTRY
IN SOUTH AFRICA.

Among the many problems that the sweet industry in this country has had to overcome was the prejudice which favoured imported confectionery as against the local product. Fortunately this prejudice is slowly disappearing, firstly because imported sweets are largely unobtainable, and, secondly because the quality of the South African manufactured article has improved tremendously. Both the quantity and value of sweets produced in this country have increased over the last decade, and the following table indicates clearly the growth of the sweet industry since 1939/40.

TABLE 1.

QUANTITY AND VALUE OF SWEETS MANUFACTURED IN THE
UNION OF SOUTH AFRICA
1939/40 ----- 1950/51

| <u>Year</u> | <u>No. of Firms</u> | <u>Quantity in LBS</u> | <u>Value in £'s</u> | <u>Average Value per lb. in Pence</u> |
|-------------|-------------------------|----------------------------|-------------------------|---|
| 1939/40 | 46 | 55,644,364 | 2,072,735 | 8.9 |
| 1940/41 | 48 | 65,968,809 | 2,576,185 | 9.4 |
| 1941/42 | 49 | 71,499,098 | 3,034,338 | 10.2 |
| 1942/43 | 49 | 74,999,031 | 3,513,061 | 11.2 |
| 1943/44 | 55 | 81,736,981 | 3,887,732 | 11.4 |
| 1944/45 | 61 | 86,785,562 | 4,370,005 | 12.1 |
| 1945/46 | 65 | 83,715,840 | 4,800,535 | 13.8 |
| 1946/47 | 68 | 87,096,035 | 5,539,034 | 15.3 |
| 1947/48 | 73 | 90,127,219 | 6,185,017 | 16.5 |
| 1948/49 | 69 | 89,253,055 | 6,321,667 | 17.0 |
| 1949/50 | 62 | 95,688,281 | 6,889,767 | 17.3 |
| 1950/51 | 66 | 103,628,207 | 8,456,738 | 19.6 |

Prior to World War 11, raw materials were easily and cheaply available, and generally there was an era of semi-prosperity in the entire sweet industry in this country. With the outbreak of war and the subsequent restrictions on the importation of both raw materials and imported confectionery, a very strong sellers' market was developed and

boom conditions prevailed, no difficulty was experienced in selling anything that was produced. During the immediate post-war years, however, conditions became extremely difficult because there were acute shortages of essential raw materials, the prices of these materials increased enormously (e.g. cocoa beans rose from a pre-war price of £20 per ton to a post-war price of over £300 per ton) and the amount of manufactured sweets imported increased rapidly. Just as this latter problem began to cause serious difficulty to the sweet industry in this country, however, import control was introduced in November 1948, resulting in a sharp decline in the quantity of foreign manufactured confectionery imported. A number of overseas firms then set up factories in this country and this resulted in a further enhancement of quality of the local product. The following table shows the quantity and value of sweets imported into the Union of South Africa, and emphasises the drastic effects of both World War II and later of import control.

TABLE 2.

QUANTITY AND VALUE OF SWEETS IMPORTED INTO THE UNION OF SOUTH AFRICA 1939 ----- 1952

| <u>Year</u> | <u>Quantity in LBS.</u> | <u>Value in £'s</u> | <u>Average Value per lb.</u> |
|-------------|-------------------------|---------------------|------------------------------|
| 1939 | 3,719,387 | 205,017 | 13.2 pence |
| 1940 | 2,111,463 | 144,514 | 16.4 " |
| 1941 | 2,889,991 | 243,216 | 20.2 " |
| 1942 | 350,942 | 26,347 | 18.0 " |
| 1943 | 519,591 | 39,498 | 18.2 " |
| 1944 | 512,802 | 35,306 | 16.5 " |
| 1945 | 259,291 | 29,203 | 27.0 " |
| 1946 | 2,678,593 | 329,157 | 29.4 " |
| 1947 | 5,821,938 | 640,084 | 26.4 " |
| 1948 | 7,480,912 | 682,341 | 22.0 " |
| 1949 | 289,877 | 22,748 | 18.8 " |
| 1950 | 89,701 | 9,087 | 24.3 " |
| 1951 | 111,816 | 11,754 | 25.2 " |
| 1952 | 89,004 | 10,269 | 27.7 " |

NOTE. The value in pounds sterling is the F.O.B. value.

It is of interest to note that the average value in pence per pound for the imported sweets, is always higher than the price for the local product (see Table 1), yet despite this, importers experienced very little difficulty in competing against the local product. This proves that though the quality of the local product has improved enormously, there is still a bias in favour of the imported article, though this is less marked than previously.

If the demand for sweets is distributed roughly in accordance with the apportionment of the national income, then from 45% to 50% of the sweet industry's output should be sold in the Southern Transvaal. The production of sweets in the main industrial centres of the Union for the year 1950/51 is given in the following table. It will be noticed that only about 22% is produced in the Transvaal in the city of Johannesburg, therefore one can conclude that a substantial proportion of the coastal manufacturers' production must be sold in the Witwatersrand market.

TABLE 3.

VALUE OF SWEETS MANUFACTURED IN THE PRINCIPAL INDUSTRIAL CENTRES OF THE UNION OF SOUTH AFRICA, 1950/51.

| <u>AREA</u> | <u>Value of Production</u> | <u>1950/51 Percentage</u> |
|---------------------------|--------------------------------|-------------------------------|
| Durban & Pietermaritzburg | £1,392,033 | 16.93 |
| East London | £1,506,268 | 18.31 |
| Port Elizabeth | £1,727,575 | 21.00 |
| Cape Town | £1,772,854 | 21.58 |
| Total of Coastal Areas | £6,398,730 | 77.82 |
| Johannesburg | £1,825,060 | 22.18 |
| | £8,223,790 | 100.00 |

The six towns in the above table contributed 95.5% of the

entire output of the sweet industry in 1950/51, and the other 4.5% (small rural establishments), can be ignored as being of no material importance. These rural firms usually suffer severe locational disadvantages and almost invariably produce cheaper lines, such as those used for the native trade.

The sweet industry's products falls into the luxury class of foodstuffs, and therefore, the sweet industry is sensitive to changes in economic conditions (i.e. prosperity and depression), but because a wide price range exists, the fluctuations in demand are not excessive. It has been found that in periods of economic recession the public purchases a lesser quantity of expensive sweets and more of the cheaper lines. On the whole there is no sharp decline in sales quantitatively, though quite naturally there is a reduction in sales in terms of money. In addition to being influenced by periods of prosperity and depression, the sweet industry in this country exhibits a very marked seasonal fluctuations. As a rule the months January to May, inclusive, are times of comparatively slack business activity but there is a minor boom around the Easter period, while the latter half of the year is definitely the busy period, being the preparation for the annual Christmas trade.

LABOUR FORCE

The racial composition of the labour force has changed markedly in the sweet industry, as is illustrated in Table 4.

TABLE 4.

A COMPARISON OF THE PERCENTAGE NUMBER OF EMPLOYEES OF
DIFFERENT RACES EMPLOYED IN THE SWEET INDUSTRY
IN 1942 AND 1953.

| | 1942 | 1953 |
|-----------|--------------|--------------|
| Europeans | 48.6 | 33.9 |
| Natives | 16.7 | 43.4 |
| Asiatics | 16.0 | 6.1 |
| Coloureds | <u>18.7</u> | <u>16.6</u> |
| | <u>100.0</u> | <u>100.0</u> |

Table 5 lists the number of employees according to race, sex and age as at April 1953. This table illustrates clearly the distribution of the 6,721 employees in the sweet industry in 1953.

T A B L E 5

NUMBER OF EMPLOYEES ACCORDING TO AREA, RACE, AND SEX
AS AT APRIL, 1953.

| AREA | EUROPEAN | | NATIVE | | ASIATIC | | COLOURED | | ALL EMPLOYEES | | | PERCENTAGE ACCORDING TO AREAS | | |
|--------------------------------------|----------|--------|--------|--------|---------|--------|----------|--------|---------------|--------|-------|--|-------|-------|
| | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | MALE | FEMALE | ALL | | | |
| Bloemfontein..... | - | 3 | 7 | - | - | - | 1 | - | 8 | 3 | 11 | .16 | | |
| Cape Town..... | 125 | 101 | 172 | - | 2 | 2 | 237 | 654 | 536 | 757 | 1,293 | 19.24 | | |
| Durban..... | 36 | 39 | 240 | 2 | 329 | 4 | 2 | 16 | 607 | 61 | 668 | 9.94 | | |
| Pietermaritzburg..... | 56 | 153 | 117 | - | 57 | - | - | - | 230 | 153 | 383 | 5.70 | | |
| Waschbank and Dundee. | 7 | 7 | 56 | 86 | 6 | - | 4 | 18 | 73 | 111 | 184 | 2.74 | | |
| East London..... | 175 | 527 | 631 | 9 | - | - | 1 | - | 807 | 536 | 1,343 | 19.98 | | |
| Umtata..... | 2 | 1 | 14 | - | - | - | - | - | 16 | 1 | 17 | .25 | | |
| Kingwilliamstown..... | 6 | 7 | 18 | - | - | - | - | - | 24 | 7 | 31 | .46 | | |
| Johannesburg..... | 143 | 410 | 1,107 | 99 | 3 | - | 13 | 48 | 1,266 | 557 | 1,823 | 27.12 | | |
| Germiston..... | 4 | 2 | 61 | 4 | - | - | - | - | 65 | 6 | 71 | 1.06 | | |
| Boksburg..... | - | - | 5 | - | - | - | - | - | 5 | - | 5 | .07 | | |
| Standerton..... | 1 | 2 | 29 | - | - | - | - | - | 30 | 2 | 32 | .48 | | |
| Volkstrust..... | 4 | 14 | 44 | - | - | - | - | - | 48 | 14 | 62 | .92 | | |
| Pietersburg..... | 5 | 14 | 23 | - | - | - | 1 | - | 29 | 14 | 43 | .64 | | |
| Pretoria..... | 3 | 8 | 12 | - | - | - | 12 | - | 27 | 8 | 35 | .52 | | |
| Port Elizabeth..... | 119 | 307 | 182 | - | 1 | - | 100 | 11 | 402 | 318 | 720 | 10.72 | | |
| TOTAL: | 686 | 1,595 | 2,718 | 200 | 398 | 6 | 371 | 747 | 4,173 | 2,548 | 6,721 | 100.00 | | |
| Total According to Race..... | 2,281 | | 2,918 | | 404 | | 1,118 | | | | | | | |
| Percentage according to Race..... | 33.93 | | 43.42 | | 6.02 | | 16.63 | | | | | | | |
| | | | | | | | | | | | | Percentage according to Sex..... | 62.10 | 37.90 |

FINANCIAL ANALYSIS

The capital invested in the sweet industry in equity¹ and loan capital was as follows:-

| | |
|-----------------------------|------------|
| At 31st December 1951 ----- | £6,798,000 |
| At 31st December 1952 ----- | £7,115,000 |
| At 31st December 1953 ----- | £7,263,000 |

The average net profit on the foregoing investment, after providing for income tax at current rates was as follows:-

| | |
|-----------------------------------|------|
| For the year ended 31/12/51 ----- | 7.9% |
| For the year ended 31/12/52 ----- | 6.4% |
| For the year ended 31/12/53 ----- | 7.9% |

It is quite apparent from the above information that the sweet industry in this country does not yield a particularly good return on capital invested.

From financial statements obtained from 45 establishments (88.2% of the total production of the industry), table 6 was drawn up which enabled a complete analysis to be made for the financial year 1951/2 and for 44 firms for the financial year 1950/51.

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1. It will be noticed from Table 7 that the total capital employed in the sweet industry as at the 30/6/52 was £4,865,689 which on the surface appears to be very much different from the £7,115,000 employed as at the 31/12/52 as stated on this page, even taking into account the fact that there is a difference in time of six months. The reason for this is that the latter figure is made up of equity and loan capital i.e. all capital including the reserves of all the confectionery firms investigated, whereas the smaller amount as shown in Table 7 does not include the figure of the reserves.

The profits as shown in Table 6 are extremely sensitive to changes in the price of raw materials as is shown by the fact that a slight percentage increase in raw materials of 2.8%, was largely the cause of the reduction of profits from 6.7% to 4.7%, despite the fact that turnover increased by over 5%. Admittedly other expenses increased as well, but it will be noticed from Table 6 that raw materials contributed by far the greatest percentage of total cost in both the years 1950/51 and 1951/52. A great hazard in the sweet industry is the fact that the price of raw materials are constantly fluctuating and in many firms, it has been found that profits are entirely dependant on how and at what prices raw materials have been purchased².

1) (continued).

The reason for the using of different figures is that the information was obtained from two different sources. The lesser sum being obtained from a report by the Wage Board on conditions in the sweet industry, whereas the larger amount was obtained from a report to the Minister of Finance, in connection with the removal of the excise duty as applied to the sweet industry. The figures obtained from the latter report probably included the amount of the reserves so as to emphasise the poor return obtained by producers in the sweet industry, in order to strengthen the manufacturers' case for the removal of the excise duty.

2. To give some indication as to the extent of the variation in prices of raw materials used in the sweet industry, the following example is given:-

The price of cocoa butter (one of the main ingredients used in the manufacture of chocolate), was £1,100 per ton in January 1954, whereas a year later it had dropped to £750 per ton, and in April 1955 the price had fallen to just over £500 per ton.

T A B L E 6.

CONSOLIDATED MANUFACTURING, TRADING AND PROFIT AND LOSS ACCOUNTS
IN RESPECT OF 44 AND 45 ESTABLISHMENTS ENGAGED IN
THE SWEET INDUSTRY FOR THE FINANCIAL YEARS 1950/51 AND 1951/52 RESPECTIVELY.

| Financial Year 1950/51 | | | Financial Year 1951/52 | | |
|------------------------|----------------|--------|------------------------|----------------|--------|
| <u>Turnover</u> | 7,845,730 | 100.0% | <u>Turnover</u> | 8,286,732 | 100.0% |
| Materials | 4,263,439 | 54.3% | Materials | 4,625,997 | 55.8% |
| Sal. & Wages | 1,569,967 | 20.0% | Sal. & Wages | 1,676,324 | 20.2% |
| Factory Exp. | 368,793 | 4.7% | Factory Exp. | 395,529 | 4.8% |
| Depreciation | <u>140,867</u> | 1.8% | Depreciation | <u>161,512</u> | 1.9% |
| GROSS PROFIT | 1,502,664 | | GROSS PROFIT | 1,427,370 | |
| Admin. Exp. | 223,994 | 2.9% | Admin. Exp. | 240,134 | 2.9% |
| Gen. Exp. | <u>555,184</u> | 7.1% | Gen. Exp. | <u>642,323</u> | 7.8% |
| Profit (before Tax) | 723,486 | | Profit (before Tax) | 544,913 | |
| Taxation (estimated) | <u>198,662</u> | 2.5% | Taxation (estimated) | <u>152,725</u> | 1.9% |
| NETT PROFIT | <u>524,824</u> | 6.7% | NETT PROFIT | <u>392,188</u> | 4.7% |

Of the capital employed by the forty-four firms in the sweet industry as at the year ending the 30th June 1952, 38.7% was loan capital - the rest being own capital. This is considered a high percentage by many accountants, and in many ways can be regarded as an unsatisfactory feature of the sweet industry in this country, as interest on the loan capital has to be paid irrespective of whether profits are made or not. Consequently during periods of business recession many firms may find themselves unable to meet their commitments.

For the financial year 1951/52, sixteen firms had turnovers ranging from £25,000 to £100,000 with an average of £46,231. This group earned 3.4% of the total profits and accounted for 8.9% of the total turnover of the sweet industry in this country. This group was more profitable than the smallest group (having a turnover of under £25,000 per annum), which gave an average return of capital employed of 3.4%, and 1.8% on turnover. The combined group of thirty establishments with turnovers under £100,000 per annum, had an average turnover of £30,972, earned 3.8% of the total profits, expended 11% of the total wage bill and accounted for 11.2% of the total turnover. The final group of fifteen firms employed 86% of the total number of employees, accounted for 88.8% of the aggregate turnover and earned 96.2% of the total profits. The ratio of total costs to turnover of these firms was only 93% as against 97.1% for the thirty establishments with turnovers of less than £100,000 per annum. Whereas the thirty small establishments had an average net profit of only £497 and an average return of

only 3.1% on capital employed and 1.8% on turnover, the fifteen largest establishments had an average profit of £25,152, and showed a net gain of 8.3% on capital and 5.1% on turnover.

Table 7 comprises a comparative statement showing the trading results of establishments engaged in the industry in respect of the financial years 30th June 1938, 1940 and 1952. A comparison of the trading results for the three years shows that a considerable expansion has taken place, though it must be borne in mind that the real expansion has been exaggerated by the inflation of prices that has taken place ever since the outbreak of World War II.

TABLE 7.

COMPARATIVE STATEMENT SHOWING THE TRADING RESULTS OF ESTABLISHMENTS ENGAGED IN THE SWEET INDUSTRY FOR THE MOST PART IN RESPECT OF THE FINANCIAL YEARS ENDED
30th JUNE 1938, 1940 AND 1952.

| Year | 1938 | | 1940 | | 1952 | |
|------------------------|---------------|-------|---------------|-------|---------------|-------|
| | Amount in £'s | x% | Amount in £'s | x% | Amount in £'s | x% |
| No. of Firms | 39 | | 33 | | 45 | |
| Capital | | | | | | |
| Own | 1,123,444 | - | 1,186,586 | - | 2,913,370 | - |
| Loan | 418,441 | - | 477,281 | - | 1,952,319 | - |
| TOTAL | 1,541,885 | | 1,663,867 | | 4,865,689 | |
| Turnover | 1,755,476 | 100.0 | 1,981,922 | 100.0 | 8,286,732 | 100.0 |
| Materials ^x | 924,449 | 52.7 | 926,870 | 46.8 | 4,625,997 | 55.8 |
| Wages & Sal. | 359,665 | 20.5 | 395,343 | 19.9 | 1,676,324 | 20.2 |
| Mnf. & O/H Expenses | 308,332 | 17.5 | 409,259 | 20.7 | 1,439,498 | 17.4 |
| Net Profit | 163,040 | 9.3 | 250,450 | 12.6 | 392,188 | 4.7 |
| % on Own Capital | 14.5 | | 21.1 | | 13.5 | |
| % on Total Capital | 10.6 | | 15.1 | | 7.8 | |

^xIncluding duty and railage charges, packing materials and containers, but excluding the wage cost of employees engaged in making containers.

NOTE. The columns headed x% are the percentage of turnover columns, i.e. what certain items represent when expressed as a percentage of turnover.

Though the sweet industry in South Africa cannot in any way be looked on as being of major importance among the secondary industries in this country, it does employ some seven thousand workers. In addition, South African raw materials such as sugar, milk, butter and eggs to the value of £350,000 are used annually in the manufacture of sweets. The industry as a whole can only be regarded as fairly profitable (owing to the fact that confectionery firms in this country are by and large equipped to produce a far greater output than is at present the case), i.e. they produce below full capacity. In this connection, the confectionery firm under examination in this thesis is able to produce far more than it actually does, (which is probably typical of any other sweet manufacturing firm), but production is rigidly governed by the level of sales, as it is a risk to produce sweets in bulk for stocks because they might deteriorate. The obvious solution is to develop sales promotional media with the ultimate aim of increasing turnover and hence profits. If this occurred, the sweet industry in its own small way, would then become increasingly important in contributing to the national welfare of the people of South Africa. More people would be employed to cope with the extra work, increasing amounts of South African produced raw materials would be used and finally, and probably most important, because factories would be producing at full capacity, certain economies should be

effected which could be passed on to the consumer, who in turn would be able to purchase more confectionery products and would thus further stimulate prosperity in the sweet industry in this country.

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 2. A Report to the Minister of Finance in December 1954 on behalf of the sweet manufacturing industry in connection with the removal of excise duty on sweets.
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CHAPTER 2.

THE HISTORY OF THE FIRM SINCE 1918.

The confectionery firm under review commenced operations in 1918 in wood and iron premises. At that early stage in the firm's history, no machinery was used and no hired labour was employed, all the work being done by the founder assisted by members of his family. Naturally, only poor quality sweets were produced and whatever profits were made, were ploughed back into the firm. Largely as a result of this policy, the annual turnover in 1920 reached the then impressive figure of £2,400. As sales and profits increased so expansion took place and in 1924, production was greatly facilitated by the building of a new factory. At this stage, no thought whatsoever was given to scientific layout of plant nor to production planning and control - (the whole object being to produce as much as possible and as cheaply as possible). That this policy met with some success is shown by the fact that, in 1929, it was found necessary to build a new factory on its present site. Owing to the increasing scope of operations of this firm, it was also found advisable at this time to acquire the status of a private company and so obtain the protection offered by the limited liability regulations. Largely as a result of the building of the new factory and the installation of modern machinery, the turnover for that year amounted to £69,780, an increase of £40,000 over that of 1928.

It is of considerable interest to examine the so-called "costing system" that was in operation at that time.

Firstly the cost of all the raw materials used was calculated taking into account expenses such as railage and insurance. Once this figure was obtained (usually by a very rough and ready calculation), it was doubled, and this doubled price was taken as the cost of the line produced. This method, it was believed, ensured a price at which a profit could be made. Where competitors' products were sold at lower prices, the prices of this firm were simply reduced so as to bring the price range into alignment so that in actual practice the "costing system" had very little to do with the fixation of prices. This rather haphazard system of price fixation, however, did not seem to affect the firm adversely as profits reached the sum of £4,040 in 1929. This profit represented a return of $5\frac{3}{4}\%$ on sales and thus it can be assumed that, though the costing system did not result in actual losses being incurred, it certainly did not lead to excess profits being earned. The inaccuracies of this costing system will be strongly revealed in Chapter 7, where it will be observed that in many cases the labour and overhead rate is very much more than the cost of raw materials. How much more true must this have been when very little machinery was employed. Admittedly the cost of labour then was very much cheaper than is the case today, but then raw materials were also much cheaper.

During the period of the "Great Depression" this firm actually prospered, (as can be seen on Diagram 1 - the graph of the firms progress), and in 1933 sales reached the record figure of £110,000, whilst profits had increased to £9,650 - a return of about 9% on turnover. There were two main reasons for this rather surprising expansion during this

period. Firstly, this firm had always followed an extremely conservative dividend policy, and largely as a result of this two depôts were able to be established which led to sales in two hitherto unexploited markets. Secondly, a certain amount of capital equipment was purchased at an advantageous price from another confectionery firm which had been forced to close on account of the difficult times.

It must not be thought, however, that the depression had no effect on this firm; indeed the effect is very marked when the 1934 turnover figures are examined. In that year the total sales of the firm amounted to £145,000 and the profits to £12,000. It can be seen from diagram 1, that though expansion did take place during the depression, this rate of expansion was not as rapid as immediately after the depression.

It will be observed from diagram 1 that the period from 1934 to 1941 was one of gradual growth with nothing untowards occurring to disturb the general progress of the firm. By 1940 turnover and profits amounted to £216,580 and £37,180 respectively, i.e. the business was then showing a return of 17% on sales. The main reasons for this growth in sales were:-

1. After the depression economic activity generally improved, and also with this, the business of the firm.
2. Plant which during the depression was not fully employed, was afterwards used more intensively.
3. The two depôts were continually expanding their sales.

The return of 17% on sales was extremely satisfactory and there were reasons for this comparatively high figure.

Firstly, a great deal of machinery was purchased which enabled this firm to produce a better quality sweet. Secondly, it was possible to produce the sweets more cheaply. Chocolates could be produced mechanically for the first time and, while no figures are available, it is probable that the profit margin on chocolates was higher than on other sweets (as is at present the case).

During the first eighteen months of World War II, the activity of the firm began to increase and the future of this firm, along with the entire sweet industry in this country, seemed to be assured. In March 1941, however, a disastrous fire occurred, destroying the major portion of the premises and plant of this firm. Nevertheless, an almost immediate commencement of building activities and recommencement of production enabled a profit of £8,460 to be made for the year. As the war had been in progress for eighteen months, it was extremely difficult to replace the destroyed machinery from the United Kingdom, though this difficulty was to a certain extent overcome by obtaining some modern machinery from the United States of America, which at that time, had not yet entered the war.

After the disaster of 1941, the production of the firm increased rapidly so that to some extent the large war-time demand for this firm's products was met. It will be noticed on diagram 1 that the difference between the sales and costs graphs is very marked and substantial profits were made. Money was plentiful and this firm like most others during the war, experienced a period of boom. In fact by so much did demand exceed supply that a system of rationing customers was introduced. Anything

produced could be sold and a situation arose in which the firm, if it so chose, could pick its own customers. Largely as a result of this sellers' market, the 1945 sales of the firm reach the record high figure of £250,000 while profits were £53,250. The fact that the profit return on turnover exceeded 20% for the first time, gives ample expression of the satisfactory state of the firm's activity.

After World War II these boom conditions continued for some time but by the end of 1947 the boom appeared to be reaching its peak and, as is always the case, costs began rising in greater proportion than sales. The main cause of this increase in costs was a rise in the price of basic raw materials such as cocoa beans and cocoa butter. Devaluation in September 1949 aggravated the position because everything the firm imported from hard currency areas rose in price. Consequently the profit for the year 1949 was reduced substantially to £40,000, as compared with the £60,000 profit made during the previous year.

As from the end of 1947 profits gradually declined and the outlook for this firm in the future appeared bleak. In 1950, however, this decline was sharply arrested owing to the manufacture and sale of fondant for export. Fondant is manufactured entirely from sugar and glucose and the manufacture is completed in one process - thus eliminating all handling charges, which represent a substantial proportion of the cost of all other sweets normally produced. Thus, though fondant in 1950 represented a good third of the sales of the firm, it was estimated by the Factory Manager that only about 18% of the total factory labour was employed in its production.

The demand for fondant arose as a result of the sugar shortage in the United Kingdom which so adversely affected manufacturers of confectionery products in that country, that they were forced to import fondant in order to overcome their difficulties. South African fondant was preferred to that of the continental countries since there was a preferential duty on that imported from this country. Largely as a result of this business, the sales of this firm increased to £740,000 in 1950 whilst profits reached the fantastic figure of £96,980. This vast increase in profits was largely due to the fact that an estimated 50% profit was made on fondant exported overseas. Unfortunately for this firm, this lucrative business did not continue for any length of time, as at the beginning of 1951 the South African Government refused to grant any further permits for the export of sugar. This, of course, meant that fondant could no longer be exported as it was manufactured to a very large extent from sugar, and if the export of fondant were permitted, it would have provided a means of exporting sugar in a slightly disguised form.

Thus, though the 1951 turnover figure of over £600,000 compared extremely favourably with that of previous years it in no way approached the 1950 record figure. In addition, the cost of basic raw materials continued to increase in price, with the result that for 1951, though the turnover figure was so high (compared to years other than 1950), the profits of the company were reduced to £17,000 - a very marked decrease from the previous year's figures. With no possibility of the lifting of the restrictions on the export of fondant, it seemed as though 1952 would merely be a repetition of 1951, with once again only small profits being earned.

By March 1952 the firm had already lost over £9,000 and its financial structure was seriously weakened. With the introduction of the Government excise duty of threepence per pound weight on the sale of sweets, it seemed that the position must deteriorate still further. The introduction of this duty gave rise to fears that the sales of sweets would slump disastrously, and that this would result in a general curtailment of the firm's activities. Surprisingly, sales actually increased over the 1951 figure, tending to lead one to conclude that the excise tax had no effect on the sales of the firm.

Since 1929 sales have increased steadily and for the first six months of 1951 they amounted to £212,000, whilst for the first half year of 1952, the corresponding figure was £233,000. This is what one would normally expect as the long term trend shows that sales have tended to increase each year. The point to note here is that sales increased despite the imposition of the excise duty. It is difficult to estimate how much greater sales would have been if no duty had been imposed. In addition to any adverse effects the duty may have had on the sales of this firm, it also gave rise to extra expense because additional administrative staff had to be employed to cope with the extra work involved.

The main reasons why the tax did not have too marked an effect on sales, were:-

1. Exemption was granted on penny, twopenny and threepenny lines and naturally this firm concentrated to a large extent on the production of these lines.

2. The duty did not effect the sale of high priced chocolate assortments, because if people were prepared to pay 6/3 per pound for chocolates, they would not object to paying 6/6 per pound.
3. A number of retailers decided to cut their profit margins slightly so as to maintain turnover. Thus in some cases it was the retailer rather than the firm who bore the burden of the tax.

Although no records were kept of the sales of different lines, it was very apparent to the Factory Executives, that the sales of cheap lines were reduced considerably by the imposition of the excise duty, as naturally this duty may increase the price of the cheap lines by anything up to 25%, whereas in the case of the more expensive sweets, it may only increase the price by five to ten percent. Despite the introduction of this excise duty, however, a profit of about £28,500 was made in 1952, a substantial increase over the previous year.

During 1952 and 1953 a vast expansion programme was initiated which it was hoped would lead to economies in production and expansion in output. These hopes were to some extent realised when the profit for 1953 amounted to £29,964, though turnover had fallen from the 1951 level of over £600,000 to £540,000. It is difficult to state, however, just to what extent this increase in profits was due to the new buildings and machinery or to normal fluctuations in trade. In 1954 there was a further set-back when profits once again fell, even though only by £5,000. What 1955 holds in store for this firm is by no means certain, and none of the Factory Executives are prepared to forecast at what level sales and profits are likely to be.

If diagram 1 is carefully examined, it will be noted that generally there has been a fairly steady increase

in the turnover of this firm, though profits have varied considerably, and profits have often been reduced even though turnover may have expanded. This interesting point fully bears out the importance of the costs of raw materials as it is quite possible that any increase in sales may, to a large extent, be offset by an increase in the cost of raw materials. The problem of purchasing raw materials is an important one, because prices fluctuate constantly (particularly of imported commodities), and often it is the price at which these materials are purchased which determines whether a profit or a loss will be made in any particular year.

A further interesting point revealed from diagram 1, is that though the sales of this firm have increased generally up to 1951, from that year onwards sales have remained at practically the same level. This is extremely significant and unless sales can be increased, it is quite certain that this firm will incur a loss if costs increase very greatly above the norm in any particular year. As stated in the previous paragraph, it was sometimes the experience of this firm that the effect of any increase in sales was neutralised by an increase in costs (primarily brought about by an increase in the price of raw materials). Thus if there is no expansion in sales, and should costs continue to increase (as they may well do), it is possible that this firm will find itself, if not in financial difficulties, then at least in a position where it is unable to declare any dividends. The solution seems to lie in an

expansion of sales through an intensified sales promotional campaign.

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The financial records of this firm.

NOTE.

Owing to the inadequate records kept between the years 1918 to 1930 inclusive, it has only been possible to plot the sales, costs and profits of this firm from 1931 onwards on diagram 1. In order to illustrate the seasonal nature of this firm's business, all information is plotted in half years commencing as from the half year ended June 1931.

CHAPTER 3.

SCIENTIFIC MANAGEMENT
AS A FACTOR IN PRODUCTION.

Management is needed in all fields of business activity because the objects of an enterprise have to be defined and the best possible policy for achieving those objects, laid down. A second function of management is to decide the means, by which the plan of action is to be carried out. Typical of these actions are the maintenance of adequate supervision, and methods of instructing and controlling factory personnel in the performance of their daily work. Finally, there is the administration of the financial side of affairs - the assessing of achievements and results, costs of operation and yearly profits or losses.

Broadly speaking, management is concerned with seeing that the work gets done - scientific management being concerned, by applying a scientific method, not only in seeing that the work is done, but that it gets done in the most efficient manner. Scientific management is not only concerned with the direct physical act of seeing that the work is being performed satisfactorily, but, also with such supplementary physical acts as reviews of progress, leadership and co-ordination of workers and research - all of which facilitate in the long run, the production of a more economically produced and better article. The argument in favour of scientific management is that, though the work could be performed without any person performing the management function - the work could not be effectively carried out.

Scientific management yields many benefits not only to employers but also to employees. The most important benefits of scientific management to employers are:-

1. Production will flow smoothly, without any loss of man hours resulting from production "bottle necks", such as too few machines being used for a certain operation, thus not only delaying the completion of that particular operation, but also all subsequent operations.
2. It ensures that all labour and raw materials used will be employed in the most efficient and economical manner.
3. It minimises the possibility of large sums of capital being tied up in the form of excess stocks of raw materials and completed goods.
4. Production and sales will be dealt with compositely and not as separate entities. This ensures co-ordination between sales and production personnel, ensuring the reduction to a minimum of problems such as arise when goods are out of stock, because the production cannot cope with the sales of a line. At the same time, it is possible because of lack of co-ordination to find that many lines which can easily and quickly be produced, are not being sold because sales personnel have not been informed that the sale of those lines should be intensified.
5. In addition to the above benefits, scientific management assists in yielding maximum economics by ensuring that the labour force of any firm is kept at the economic minimum. Any procedures which hinder production, e.g. rush orders are minimised, and all efficient methods that can in any way improve production output or sales are adopted. Scientific management involves the use of a sound system of production planning and control, and the maintenance of an organisation concerned with the morale or will to work and co-operation of the people employed. Similarly, on the sales side, scientific management involves the setting up of a sound and efficient distribution organisation, and the adoption of those methods which ensure maximisation of sales.

6. Possibly the greatest advantage of scientific management is the vast source of information which it makes available in the form of production records and other important statistics. Not only is such information made available, but the information is as concise as is possible. The information must be such that all unnecessary detail is eliminated.

From the employees' point of view, scientific management ensures safe and healthy working conditions. In addition, attention is focussed on other matters affecting workers such as canteens and fatigue study.

GENERAL OBSERVATIONS ON SCIENTIFIC MANAGEMENT.

Methods which facilitate production or selling can be included under the heading of scientific management, provided they are organised in a scientific way. Thus a sound incentive wage scheme will facilitate production, whilst a sound advertising policy will facilitate an expansion of sales. It must be noted, though, that the mere introduction of such schemes does not automatically ensure that a scientific course of management is being followed. Unless such incentive schemes, or advertising policies are in themselves sound, no extra benefits will accrue. This is an extremely important point as many firms maintain they are following a policy of sound scientific management merely because they have introduced systems of incentive wages, advertising or production planning.

To determine exactly what the scientific method is, a clear statement of the problem should be formulated. One

can only deal with an ailment once it has been accurately diagnosed. Therefore until such time as the problem itself can be clearly stated, it is of no avail to look for any solution. The following steps provide a useful guide to procedure once the problem has been defined:-

1. All facts which have been previously discovered about the problem should be collected and recorded in a useable form. This involves the looking up of old records, reading technical journals and making use of all other possible sources of information which are available.
2. The observation, collection and recording of all possible present facts relating to the problem and its solution. This may involve personal visits, interviews and correspondence with persons or organisations which have had experience with similar problems.
3. The analysis and classification of all facts obtained.
4. The deduction based on logical reasoning from the facts, and the formulation of a solution to the problem.
5. The testing and re-testing of the solution, and repetition of the investigation and use of the solution as long as it proves to be correct and adequate.

Thus, before any system such as that of incentive wages is introduced, possible consequences have to be examined and re-examined to ensure that such a system will indeed be a step in furthering the establishment of scientific management and not a mere additional difficulty to add to managements' responsibilities.

Benefits of scientific management are not only confined to employers. For example the introduction of an

incentive wage scheme enables employees to earn higher wages on some basis of increased output. It is a reasonable assumption to make, therefore, that employers as well as being interested in increased output, are also interested in improving the level of earnings, and therefore, of the standard of living of their employees, though admittedly this may only be of secondary interest. It has been learned over the years that higher earnings, without increased production, are invariably followed by higher prices for commodities, and are not the solution of the problem of achieving maximum economic production. This latter fact justifies the paying of an incentive for increased production where extra wages are paid only for extra production. A system of scientific management, therefore, must be such as to allow higher production to take place. Increased earnings of employees is an incidental result.

One important aspect of scientific management and one that is frequently overlooked, is the question of selection of employees and employee-management relations. It is generally recognised that employees form the most dynamic element in the production of the growing needs of a developing community. Yet, regardless of how carefully an employee is chosen, or how well he appears suited to a particular job, his continued productivity can only be assured by maintained constructive encouragement. Thus one of the duties of an employer operating under scientific conditions, is to make certain that employees have full opportunities for using their abilities on the job and to stimulate those employees to a full utilisation of their capacities. If this is not done, and employers act on the assumption that having been

chosen and placed in the job, every employee will of his own volition produce some articles in accordance with the employers requirements, the outcome will not be satisfactory to either the employer or the employee.

The basic aim of all manufacturing concerns is to make profits by attempting in so far as possible, to sell all goods that can be produced. Thus all fields of business activity are subsidiary to the one main field of sales - all production is wanted, not in its own right, but as a means to an end - viz. sales and profits. All methods which facilitate production also tend to facilitate sales and hence profits, either by allowing the goods to be produced more cheaply, or by allowing goods of a better quality to be produced. Subsidiary production aids such as incentive wage schemes are of great importance and help if such systems are logically maintained. The question of canteens and cloakrooms is also very important and should be taken into account when applying scientific management to the field of production.

Scientific management also entails the organisation and operation of a sound financial system. Books of account should be kept on generally recognised sound accounting methods and logical systems of credit control should be introduced. Other important matters are the laying down of a definite discount policy, and a definite procedure in regard to bad and doubtful debts. Other points of note are the defining of actions and policies to be followed in regard to the collection of the debts of the firm, the placing of orders for raw materials, the invoicing of goods sold and probably most important of all, the institution and maintenance of a

sound system of internal check to avoid petty pilfering of cash and stocks.

Finally, there is the question of the creation of a sound sales organisation and the institution of a clearly laid down sales policy. Despite the importance of this branch of business activity, it is this field that is most frequently neglected by business executives. In many firms (including the undertaking under discussion in this thesis), a great deal of attention has been focussed on the improvement of production methods and the increasing of production, whilst the sales organisation has been allowed to progress in a haphazard manner. The probable reason for this is that difficulties or breakdowns in production are far sooner noted or far more easily recognised, than any sales problem which may arise. For example if there is a breakdown in machinery, or if goods are out of stock, the matter is immediately noticeable and can therefore be investigated and, if possible, remedied. In the sales field, however, many firms have no system of checking that all customers are being regularly canvassed by the sales representatives of the firm, or that salesmen apportion their time as economically as possible among customers. Further, no provision is made for the permanent remedy of complaints, or even for the determination of what complaints may exist, and usually notice is only taken of these if, and when customers or members of the public complain.

Thus a system of scientific management must encompass a sound production system and a sound financial and sales organisation. From what is to follow it will be observed that this firm has developed what is considered

to be an extremely efficient production system, while the sales organisation of the business, is being slowly adapted to agree with the principles of sound scientific management. Because great progress has been made in the production side of this firm, the greater part of this work is given over to a description of the recently adopted production methods, while only one chapter deals with matters relating to sales. Obviously the financial organisation such as the keeping of proper books of account, must of necessity be kept on a scientific basis like that of any other firm, so this field of scientific management is ignored in this thesis.

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PART 11.

THE APPLICATION OF SCIENTIFIC MANAGEMENT

AND

ITS DEVELOPMENT IN THE FACTORY.

CHAPTER 4.

THE BEGINNINGS OF SCIENTIFIC MANAGEMENT.

It will be seen from chapter two that, despite fluctuations in sales and profits, this firm has had quite a rapid rate of growth. The original owners started this firm initially with no intimate knowledge of the sweet trade, no idea as to what conditions would be like in the future, and only the hope that their sweet factory would survive to provide them with a sufficient income. Progress was achieved by trial and error - sweets were made, often without weighing ingredients, the flavouring and adding of artificial colouring to the sweets presented vast problems and it was by no means uncommon for the colouring and flavouring of one batch of sweets to be completely different from that of a second batch of exactly the same type of sweets. Foremen were responsible for the two very important functions of colouring and flavouring of sweets, and only an occasional check was made by the Factory Manager. Often the first time the management of the firm noticed that something was unsatisfactory about the colouring or flavouring of their products, was when customers complained. In addition to the above problem, there was the further problem of remedying complaints from customers. Often while goods were sent out in a sound condition, they were found to be damp, discoloured or otherwise damaged on arrival. The then existing personnel attempted to overcome these faults but, as can be imagined, these problems required much more knowledge and attention than the Factory Manager had at

his disposal. These problems arose repeatedly and, because there was no-one technically equipped to deal with them, very little was able to be done about it.

As this firm grew in size, these problems became increasingly acute as the question of the good name of the firm, and the matter of goodwill with the customers became of increasing importance. This was heightened after World War 11 when competition became increasingly keen. In view of this, the Directors of this firm, in 1951, decided to equip a laboratory, and to employ an Industrial Chemist who would, it was hoped, be better able to cope with the many technical problems of production than the existing personnel. The firm was fortunate in obtaining a Chemist who had had many years experience in confectionery undertakings overseas, and who therefore, had a very good idea of what the problems of this firm could be expected to be like, and what methods could best be adopted to overcome these problems. This matter was considered so important by the factory executives that over £1,000 was spent in properly equipping a laboratory to ensure that the Chemist had the best possible equipment with which to work.

The first work of the Chemist was to investigate some problems which had baffled the existing staff. The importance of his work on these problems can well be imagined, when it is realised that the Chemist in this firm entered into an undertaking where it was hoped he would be able to do something, but where nevertheless, his work was looked upon with suspicion because of lack of understanding. Because of this lack of understanding by some factory executives, it was found advisable to make

the Chemist directly responsible to the Board of Directors, thus giving him a relatively free hand. For this reason, the Chemist and his laboratory assistants were not put under the control of the Factory Manager as is often the case in other firms.

Having no real laboratory available, (a spare room in the stores was used initially) until a new building was completed, the first year's work of the Chemist was very limited. Nevertheless certain work, both of a chemical and non-chemical nature was possible. The work of the Chemist in this firm was to cover three very wide and varying fields, namely analytical control, technical experiment and research.

1. ANALYTICAL CONTROL.

This resulted in the institution of standardised methods, e.g. the boiling of raw materials and the specifications of the brands of raw materials which were to be used. All raw materials have a specific purpose in manufacture, and laboratory tests were instituted to establish the quality and suitability of each material used. The importance of this is that when only specified raw materials are used, standardised production methods should always produce the same results. The aim therefore was to eliminate as far as possible, variations in the raw materials used, and hence to ensure uniformity in the quality of the finished product.

Finished products were also checked by various tests to assess certain properties in the finished products such as colour and flavour, as well as checks on such physical properties as hardness and fineness. These tests were not necessarily chemical by nature.

This work can perhaps best be illustrated in connection with the Chemist's work to standardise two basic raw materials - flavours and vegetable fats. Regarding the former, the Chemist found that there were a number of different brands of flavourings in stock, and on examination it was found that these varied greatly in quality. Before the Chemist assumed the control of the issuing of flavourings to the factory foremen, these flavourings were issued indiscriminately by the Storeman to the manufacturing departments. If they were issued with a different brand of flavouring from the usual, the manufacturing departments had to ascertain by trial and error how to use it. Naturally, complaints about the flavouring of the sweets, either too much or too little, were common. As a result of this, the Chemist undertook to assess the respective merits of the different brands in stock, and in the course of time, selected the most suitable and controlled the purchasing of flavourings to ensure that only approved flavourings were bought by the firm. The products of all suppliers of flavouring are now investigated by means of small scale laboratory tests and when a change in supplier is warranted, the laboratory adjusts the quantity of flavour to be used.

Regarding vegetable fats, which are used extensively in the production of such confectionery as toffees and caramels, it was found that the prices of edible fats from the different sources in the Union made it uneconomical always to use those fats that are regarded as the most suitable overseas. The less expensive fats can be used without any deterioration in quality in the manufacture of some sweets but not in others. It appeared, even without

laboratory tests that the use of certain fats involved some degree of risk owing to the poor "keeping qualities" of some of the brands. These were immediately eliminated. A number of manufacturers were approached with suggestions for changing the composition of their fats in order to improve their keeping qualities without increasing the price. Two manufacturers then provided the desired articles at competitive prices. All fats now undergo a complete range of laboratory tests on receipt, to ensure that the requirements as laid down by the Chemist are fully maintained. Any fats not up to the required standard are either returned to the supplier or used in the manufacture of some of the cheaper lines of sweets where deviations from standard is of little importance.

The pattern of testing the two foregoing raw materials has now been extended to all other raw materials. Where unavoidable changes occur in the brand of raw material purchased, the factory personnel directly concerned are informed of any necessary change in recipes or production procedure. New brands of raw materials are examined by the laboratory and the suitability of these brands and their comparison with other brands are reported on, giving the buying department of the firm the necessary technical guidance.

2. TECHNICAL EXPERIMENTS.

It often happens that a problem cannot wait for the results of a long programme of research and it is necessary to substitute technical trials or experiments in order to obtain quick results. It might be that the basic principles

of a particular problem are not clearly understood, and more or less hit and miss methods have to be used in order to solve it. This is the case for example, in regard to the question of artificial colouring of sweets where the usual procedure is to make several small samples, using different quantities of colouring, and then to select the sample in which the colouring is most effective.

3. RESEARCH.

There is of course no fixed dividing line between research and experimentation, but a planned technical investigation setting out to ascertain definite information about a product or process is worthy of the name of research. These investigations originated in the laboratory, where it was considered that the information obtained would be so valuable so as to warrant the undertaking of research. Typical of such research was work to ascertain the effect of the degree of boiling, and the method of cutting and wrapping, on the keeping property of toffees. Such work took up a considerable amount of time, but once conclusions had been reached and the information made available, they were applied to all subsequent production, forming the basis of standardised recipes and technical processes.

The following section of a report by the Chemist to the Directors of the firm, dated the 14th June, 1951, is quoted in full to illustrate the application of laboratory work to production in the factory:

"APPLICATION OF LABORATORY WORK TO OUR PRODUCTION"

"Our production is on the whole varied, with one or two sections outstanding, and some of the work does not lend itself to control or require research. These sections will, however, call more on the experimental laboratory which should develop into an important feature.

A large varied business has been built up and this no doubt has been a big task requiring a wide detailed knowledge of the craft. A large staff of skilled and semi-skilled workers has had to be trained and a good deal of supervision is required to see that everything goes smoothly. The business is growing and the task of supervision becomes bigger.

There is an obvious non-chemical use for the laboratory; namely the standardisation and issues of flavourings and colouring so that, given consistent production methods, our flavours and colours will be consistent and of the standard laid down. At present our stocks of flavouring are rather mixed, and production departments sometimes find difficulty in maintaining regularity with the materials issued. It is proposed to organise an essence department, which should be responsible for the issuing of colouring and flavouring in batch quantities, and also be responsible for the stocks of materials required for this purpose. Buying should be on the laboratory's advice, which will take into account price and the quality of flavouring and colouring, in assessing the value of the materials required, and will also determine the quantities required for manufacture. The production departments will thereby be relieved of any need to test out their colouring and flavouring, and the product should be of the standard required.

It is suggested that in setting standards for colouring and flavouring, a group of people representative of production, sales and laboratory should agree on the standard for each product first. Samples can be submitted to this group for approval and the standards passed as suitable will be incorporated in the standard recipes.

This brings a further point of control into consideration. To ensure that recipes are being used and ordered, all recipes should be recorded, and any alterations should not be permitted without prior consent. The laboratory with its raw material testing and control testing of products is the department which could well be responsible for keeping a record on behalf of management of any change of recipe or method. It could also when necessary check that the

correct recipe and procedure is used. In this way factory management is relieved of detailed supervisory work.

The two functions just suggested are non-chemical means of product control. Actual laboratory work for product control purposes will consist of:-

1. Testing raw material deliveries and buying department samples of new brands.
2. Testing finished products to ascertain that they are of the standard laid down by the group of personnel previously suggested.

These important functions of essence control, recipe records and analytical control of materials and products should go a long way to ensure regularity of product at a standard suitable to all concerned.

To establish these records we shall need to carry out a number of tests and for some purposes research is required. For example "keeping property" tests on our caramels are being started as I feel that we are at present boiling our sweets at so low a temperature, that the shelf life of these products must be very short. In addition to the work suggested it is certain that numerous experiments will be required at first, but we must ensure that the fundamental work designed to help to maintain regularity in our routine production, is not side-tracked by intermittent day to day problems".

The above report reveals very clearly the scope and effect of laboratory work on production in the factory, and it can be seen that the first step towards scientific management was in the introduction of standardisation of raw materials, recipes and certain methods of production such as the degree of boiling required. For the first time in the history of this firm, some production work was being carried out in a scientific, logical and well ordered manner.

In addition to the above type of work, the Chemist attempted to establish a costing system, with the aim in

mind that once costs were determined, then selling prices could be established with some fair measure of confidence, and non-profit making lines eliminated. It was hoped that this preliminary system would prove the importance of, and need for the establishment of an accurate costing and planning system.

The availability of detailed costs made numerically obvious many things that were already known to experienced observers, but which needed some quantitative proof to justify action being taken.

Just prior to the establishment of this costing system by the Chemist, the selling price of goods manufactured was determined by the Directors of this firm visually examining new lines, estimating the price that they could get for it, examining the prices of competitors' lines and then only fixing the price of the line finally.

The Chemist encountered untold difficulties, in particular with regard to the allocation of overheads. Production arrangements were causing considerable loss of output due to frequent and hurried changes of programme, and the accurate allocation of overheads was impossible on the data available. Furthermore, the Chemist had had no real experience as a cost accountant and was attempting to discover the costs of goods produced by the firm - by using for the first time in the firm's history, a logical analysis to determine the costs of goods produced.

Briefly his method was as follows:-

1. The raw materials cost was accurately obtained, based on the recipes formulated by the Chemist. These were being used by the factory foremen for the first time.

2. The cost of labour was obtained by actually observing and timing the various processes which were involved in the manufacture of the sweet
3. To obtain an overhead rate, the Chemist requested the auditors of the firm to calculate all expenses of the firm (other than direct labour and materials) (a) as a proportion to direct labour - this figure came to 300% and (b) as a percentage of labour and materials - this figure came to approximately 50%.

Thus two overhead rates were obtained - the problem then being which of the two to use in costing production. Theoretically the use of either should have been immaterial, as both should give the same result. Obviously this could not work out in practice as the theoretical assumption could only be true provided that the ratio of materials to labour was always the same throughout the factory - which, of course, was not the case.

This problem was a very real one, but the Chemist finally decided to use rate (a) whenever a large amount of handwork was involved, and rate (b) whenever machinery generally was used in the production of a product. In practice it was a visual observation that determined which of the two rates be used.

Further difficulties encountered were that production processes varied from time to time, as did the number of people involved in the manufacture of the product. In addition it was certain that the two overhead rates varied from time to time, though of course this difficulty is inherent in any costing system. Finally there was the problem that sometimes rate (a) might apply to the first half of the production process and rate (b) to the latter half of the process. The following costings illustrate the principle and procedure followed by the Chemist in calculating the cost of any of the lines produced in the factory.

Costing of Peppermint Crisps (made on 10/8/53).

A.

| <u>Boiling Department</u> | <u>Cost in Shillings</u> | |
|--|--------------------------|---------------|
| | <u>Materials</u> | <u>Labour</u> |
| <u>Materials</u> - 140 lbs glucose @ 0.342/- | | |
| per lb. | 47.9 | |
| 70 lbs sugar @ 0.344/- per lb | 24.1 | |
| 15 ozs mint oil @ 58.5/- per lb | 54.8 | |
| <u>Labour</u> | | |
| 1 x 1 $\frac{3}{4}$ hours @ 4.3/- per hour | | 7.6 |
| 2 x 3 $\frac{1}{2}$ hours @ 2.1/- per hour | | 14.7 |

B.

| <u>Moulding Department</u> | | |
|--|-------|------|
| <u>Materials</u> - 57 lbs chocolate @ 2/- per lb | 114.0 | |
| <u>Labour</u> | | |
| 2 x 5 $\frac{1}{2}$ hours @ 2.1/- per hour | | 23.1 |

C.

| <u>Wrapping and Packing</u> | | |
|--|--------------|-------------|
| <u>Materials</u> - 2500 wrappers @ 11.7/- per 1000 | 29.1 | |
| 50 boxes @ 0.5/- each | 25.0 | |
| <u>Labour</u> | | |
| 16 hours @ 1.9/- per hour | --- | 30.4 |
| Yield ----- 50 boxes of 4 Dozen | <u>294.9</u> | <u>75.8</u> |

SUMMARY OF COSTS

| | <u>Shillings</u> | <u>Shillings per box</u> |
|----------------------------------|------------------|--------------------------|
| Materials | 294.9 | 5.9 |
| Labour | 75.8 | 1.5 |
| Overheads (as 300% of labour) | <u>227.4</u> | <u>4.6</u> |
| | <u>598.1</u> | <u>12.0</u> |

Thus the cost per box of four dozen pieces weighing 4 $\frac{3}{4}$ lbs is 12/-. It is interesting to compare the cost using the alternative overhead rate i.e. - as 50% of labour and materials.

Shillings per box of 4 dozen using alternative overhead rate.

| | |
|-----------|-------------|
| Materials | 5.9 |
| Labour | 1.5 |
| Overheads | <u>3.7</u> |
| | <u>11.1</u> |

Section A is largely machine work, while sections B and C are entirely handwork. Thus the problem of which rate to use is of extreme importance here as can be seen from the fact, that the two rates give substantially different answers.

Costing of Chocolate Dates (made on 9/11/52).

A.

| <u>Marzipan Department</u> | <u>Cost in Shillings</u> | |
|---|--------------------------|---------------|
| | <u>Materials</u> | <u>Labour</u> |
| <u>Materials</u> - 70 lbs dates @ 0.73/- per lb | 51.1 | |
| <u>Labour</u> - 2 x 5.5 hours @ 1.8/- per hour | | 19.8 |
| 1 x 10 minutes @ 1.3/- per hour | ----- | <u>0.2</u> |
| Total Cost ----- | <u>51.1</u> | <u>20.0</u> |
| Cost per lb of dates ----- | 0.73/- | 0.28/- |

B.

| <u>Chocolate Department</u> | | |
|---|-------------|-------------|
| <u>Materials</u> - 45½ lbs centres | 33.2 | 13.0 |
| 20 lbs chocolate @ 2.2/- per lb | 44.0 | |
| 65½ lbs | | |
| <u>Labour</u> - 8 x 15 minutes @ 1.8/- per hour | | 3.6 |
| 1 x 10 minutes @ 1.3/- per hour | ----- | <u>0.2</u> |
| | <u>77.2</u> | <u>16.8</u> |

C.

| <u>Wrapping Department</u> | | |
|---|-------------|-------------|
| <u>Materials</u> - 65½ lbs chocolate dates | 77.2 | 16.8 |
| 15 ozs foil @ 3.75/- per lb | 3.5 | |
| 18½ ozs straw paper @ 2/- per lb | 2.3 | |
| 33 boxes @ 0.4/- each | 13.2 | |
| 8 ozs parchment paper @ 2/- per lb | 1.0 | |
| 35 labels @ 7.5/- per 1000 | 0.3 | |
| <u>Labour</u> - 3 x 1 hour @ 1.8/- per hour | | 5.4 |
| 1 x 20 minutes @ 1.8/- per hour | ----- | <u>0.6</u> |
| | <u>97.5</u> | <u>22.8</u> |

SUMMARY OF COSTS

Cost in Shilling per lb.

| | |
|---|-------------|
| Materials | 1/5¾ |
| Labour | 4 |
| Overheads (as 45% of materials & labour) | <u>10</u> |
| | <u>2/7¾</u> |

Using an overhead rate of 250% of labour

| | |
|-----------|-------------|
| Materials | 1/5¾ |
| Labour | 4 |
| Overheads | <u>10</u> |
| | <u>2/7¾</u> |

Once again the problem of which overhead rate to use in this latter costing is important as section A is entirely handwork, whilst sections B and C are largely machine work. This difficulty of not knowing which overhead rate to use was one of the biggest problems inherent in the system as introduced by the Chemist. As in the latter costing, it sometimes happened that the two rates gave the same result - but this was very much the exception rather than the rule. The more frequent occurrence was a wide variation in costs as illustrated in the first costing.

Further, even if it could have been accurately determined which overhead rate should be used, there was still the difficulty of clearly dividing handwork from machine work e.g. a great proportion of the work in this sweet factory cannot be divided into one or other of the categories as the work is usually a combination of both, such as the feeding of sweets by hand into the wrapping machines. Thus the only solution which would have ensured accuracy would have been to break the operation up into stages, work out the labour and materials cost for each stage and then after each stage in the process add on the relevant overhead rate. For instance reverting to the example of the wrapping machines, the operation would have to be broken up something as follows:-

Stage 1 - The taking of the unwrapped chocolate by the machine operator and feeding the sweet into the machine. - Handwork.

Stage 2 - The length of time the sweet takes to go through the machine to be wrapped. - Machine-work.

Stage 3 - The removal of the wrapped sweet from the machine to the box of chocolates by another worker. - Handwork.

Obviously this system is impracticable because firstly, it would have made the calculation of any cost far too detailed, and, secondly, it would have meant that a machine rate per hour would have to have been calculated for each machine - something that was quite naturally beyond the Chemist, or any other factory executive at that time.

It will be noticed that in the latter costing, the ratio of the overhead rate to labour, and to labour and materials is different from the first costing of the peppermint crisps. This was because the costings were made at different times, and it was found that the overhead rates were different at each of these times. This constantly varying overhead rate was another inherent weakness in the system as the costing was only true (ignoring all other difficulties) for a specific moment of time, when such overhead rate applied. Consequently the few costings that were calculated could not be compared with each other.

Despite all these weaknesses, this first costing system was extremely important because, whatever its inaccuracies were, it did give a fairly clear indication of the maximum costs of production. To err on the conservative side, where the two overhead rates were used, the one which yielded the higher cost was usually taken as the cost of the line. Secondly this system prepared the ground and made the Directors of the firm realise the absolute necessity of having an accurate costing system. The Chemist pointed out to the Directors that such a costing system could only

come into being if :-

- (a) production and production methods were re-organised;
- (b) adequate production records were kept - the then present methods of recording information being entirely inadequate.

These points received the attention of the Directors of the firm and in an attempt to re-organise the production departments of the factory, on a sound and logical basis, as well as to institute an accurate cost accounting system, the services of an "efficiency expert" was obtained in October 1953. It was hoped that this expert would be able to rectify the deficiencies pointed out by the Chemist. As events later showed, this was to be a revolutionary step, in so far as the effects on production were concerned.

CHAPTER 5.

PAST AND PRESENT ORGANISATION
OF THE FACTORY.

PRODUCTION PLANNING.

Prior to the introduction of a system of planning by the efficiency expert, factory production was organised as follows:-

The Warehouse Superintendent supplied the Factory Manager bi-weekly, with a list of "lines" which he considered should be manufactured to ensure that adequate stocks of finished goods were available. The aim was to ensure that, as far as possible, customers' requirements should be met immediately from warehouse stocks, thus eliminating follow-on orders. These orders result when certain finished products are out of stock in the warehouse and thus, these goods have to be sent to the customer after the bulk of his order has been despatched when they arrive in the warehouse from the factory. This list of requirements was compiled after the Warehouse Superintendent had walked round the warehouse, making a visual examination of the stocks on hand. This was necessary as no stock record cards were kept, and obviously, many lines were overlooked - particularly when a line was out of stock and, thus, the Warehouse Superintendent had nothing to remind him to re-order the line. Owing to the extremely wide variety of products made by this firm (well over three hundred by 1953), he could not be expected to remember every line.

Once the Factory Manager obtained this list, he proceeded to write out the orders to the various factory foremen. Each order was written in duplicate, a separate, ordinary note-book being used for each department's order. The original was then sent to the foreman concerned, while the Factory Manager retained the copy. Each foreman had in his possession a reference book of the lines made in his department and the quantity of each batch he had to deliver. For example, the Factory Manager might order a certain mixture from the marzipan department for a Wednesday, and the foreman of that department, automatically knew what lines he had to deliver, and how much of each line he had to deliver on that stipulated day. A similar procedure was followed in the other departments and all the different components of a mixture, would be delivered to the packing department on the stipulated day. Once a foreman had delivered all the lines on his order sheet, he initialled it and sent it back to the Factory Manager. The original (returned by the foremen) was then glued to the copy of the order, (for what exact reason is not at all apparent), and the note book was set aside till the next batch of orders was to be issued.

The only time delivery days or dates were given was in the case of large mixtures weighing from six to ten thousand pounds per batch. In other cases, where no delivery dates were fixed by the Factory Manager, particularly where different departments delivered centres to the chocolate machine, no delivery date was stipulated, with the result that the foreman of the chocolate department spent a great proportion of his time running round the other departments, in an attempt to co-ordinate the

different lines of the chocolate assortment, so that they could all go through the chocolate machine on the same day. His efforts were often in vain, partially because of lack of authority and partially because of lack of co-operation.

METHODS OF PRODUCTION CONTROL PRIOR TO THE SYSTEM INTRODUCED BY THE EFFICIENCY EXPERT.

When orders were issued to the foremen of the various departments by the Factory Manager, these orders were given in convenient round numbers, such as one, two or three hundredweight. As standardised recipes were just beginning to be used, as a rule order quantities did not coincide with the batch sizes of recipes. As a result, foremen had to resort to approximations, in particular as regards flavouring and colouring, with the consequence that the latter two characteristics of the finished product varied enormously. This was a major problem as has been mentioned in the previous chapter but could easily have been overcome, if the Factory Manager had co-operated with the Chemist in an attempt to order goods in standardised batch size lots.

Secondly, there was an inadequate check on the weight of goods delivered by the foremen, as each manufacturing foreman weighed his own finished products - the foreman receiving the goods, though signing for the weight, did not check it. This basic flaw in the control system enabled foremen to rid themselves of great quantities of scrap, as they could merely write down the weight they were supposed to deliver on their manufacturing returns whilst they would actually deliver an

extra amount of goods made up of re-processed scrap. This excess would not be observed as there was no-one to check up on the foremens' delivery weights. This was of extreme importance as the Factory Manager dealt firmly with foremen who had accumulated large amounts of scrap because of careless work. The above system then, clearly provided a loophole for the foremen to rid themselves of as much scrap as possible, before it came to the notice of the Factory Manager. In a similar manner, a foreman who had not made sufficient quantity of any line to fulfil any order, could always write a fictitious weight on his daily manufacturing return. Receiving foremen often noticed by a mere visual examination that quantities received did not agree with the weights on the return, but they often did nothing about it, owing to their hesitancy in getting fellow-foremen in trouble with the Factory Manager, or because they themselves indulged in similar practices.

In cases where the Factory Manager stipulated a date for delivery and the foremen did not deliver on time, it often happened that the former only got to know of the delay when the receiving foreman complained. Obviously the reporting of one foreman's faults to the Factory Manager by another foreman, did nothing to foster goodwill between foremen, and therefore, foremen often hushed up late deliveries amongst themselves so that it would not come to the notice of the Factory Manager. This practice, though possibly leading to a spirit of good-fellowship amongst foremen, did nothing to facilitate the smooth flow of production through the factory.

Finally, owing to the way in which the Warehouse Superintendent compiled his list of lines to be ordered by the Factory Manager, rush orders were common. These arose when the Warehouse Superintendent suddenly found himself right out of stock of a particular line, and in order to avoid any possible unpleasantness with the Sales Manager, informed the Factory Manager of the position, who in turn issued a rush order for the line concerned. On receipt of this order, the foreman concerned had to leave his scheduled and planned work, and proceed with the rush order immediately. Needless to say this had an extremely adverse effect on production, particularly because these rush orders recurred with alarming frequency.

WAGE INCENTIVES.

Partially owing to the fact that inadequate records were kept, very little attention was given to the performances of individual workers. Wage payment was on a time basis, and thus the individual who perhaps may have been a better worker than his fellow-employees, found no incentive to employ his capacities to the full. From time to time, however, the foremen mentioned to the Factory Manager the capabilities of promising workers in their departments, or the Factory Manager may himself have noticed when a worker was working well. In order to encourage these workers, two schemes were put into operation:

1. The promotion of the worker to the next wage step.

2. The granting to the worker of a flat bonus, provisional on his/her maintaining a set standard. This was independent of their normal wages.

The disadvantages of these two methods are very apparent. In the first case it was always possible that the worker may almost have been due for an increase in any case, or at the most, it would give him an increase which he would have got in three months time. Thus the first method merely advanced the worker for a maximum period of three months, as after such a time any increase would have cancelled itself out, as the worker would have received it in any case.

In the second case (usually used for workers employed on individual operations such as the packing of chocolates into boxes), the worker though capable of a greater production, just maintained the set standard required to earn the flat increase.

Even ignoring the disadvantages of the above two methods, however, there was still the difficulty of determining exactly what constituted good or bad production. For example the packing of threepenny rolls of "XXX Mints" into packets and then into boxes of four dozen each was a hand operation, and in order to qualify for the flat bonus workers had to pack twenty-five boxes per day - a level around which production stabilised. Very much later, after a much more accurate determination had been made by the efficiency expert, the standard was set at twenty-eight boxes per day. Frequently the girls on this operation then packed up to forty Boxes, of four dozen "XXX Mints" each, in a day.

MANAGERIAL ORGANISATION OF THE FACTORY.

The managerial organisation of this factory is far from typical in that:-

1. There are three Managing Directors - each of whom adopts a senior executive position, in addition to their positions as Directors, e.g. the Sales Manager.
2. A great many of the senior managerial positions overlap to a considerable extent.

Prior to the advent of the efficiency expert, no one had any clear idea of what people exactly were responsible for what work, and to whom they were responsible. For example, the Factory Manager might issue instructions to the Storeman to purchase a certain foil, whilst one of the Managing Directors might alter the requirement as he saw fit, resulting in the Storeman being placed in something of a dilemma. A similar situation existed as regards the foremen and workers in the factory.

The three Managing Directors among them shared the posts of Buying Officer, Office Administrator and Controller of Credit, and Sales Manager. In addition they took a keen interest in the production side of the factory in their capacities as Managing Directors. This often led to their giving instructions directly to the various foremen concerned and not, as should have been done, through the Factory Manager. As a result of this, there was always a certain amount of confusion prevalent in the factory.

Other peculiarities in the managerial structure were that, while the vehicle drivers were under the authority of

the Dispatch Officer, the actual vehicles and their use were under the control of the Storeman. This position arose because the firm required transport to deliver finished products, as well as to obtain raw materials and general factory commodities. Taken as a whole, however, the structure while being thoroughly workable, did lead to confusion because of the absence of clearly defined lines of authority and responsibility of senior factory executives, it being only much later that a set of unwritten laws of authority and responsibility were laid down.

The managerial organisation of the firm just prior to the advent of the efficiency expert is illustrated on Page 58.

By the end of 1954 the managerial structure had altered slightly - primarily because of the division of the duties of Factory Manager into two separate posts, viz., Production Manager and Factory Superintendent. This was a direct result of the new production methods introduced by the efficiency expert which made it necessary to create the post of Production Manager, who, in addition to being in control of the cost accounting and incentive wage schemes introduced, took over the planning and control of the factory production - one of the more important tasks of work formerly carried out by the Factory Manager. It will be observed from the managerial structure chart on Page 59, that there was not so much an alteration of duties and responsibilities as compared to the previous managerial organisation but rather, the creation of additional executive positions. In order to clarify the structure chart on Page 59, it is perhaps best to illustrate the duties and responsibilities of the principal executives of the firm.

MANAGERIAL ORGANISATION PRIOR TO THE ADVENT OF THE EFFICIENCY EXPERT.

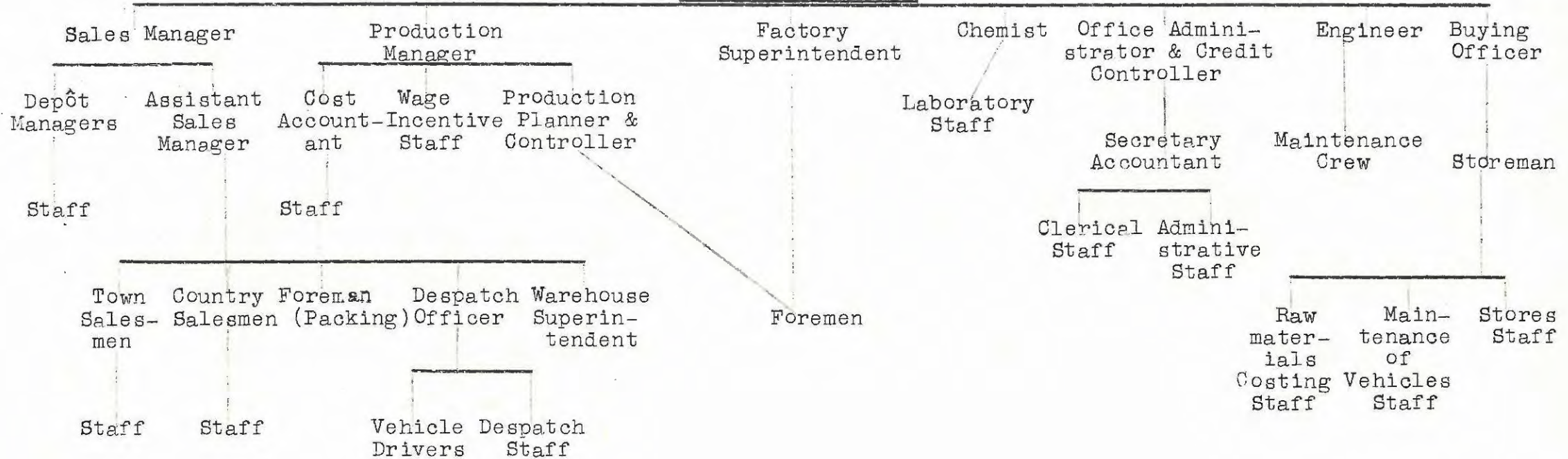
MANAGING DIRECTORS.

| | | | | | | | | | | | | |
|----------------------------|-----------------------------|-------------------|----------------------------|---|---------------------|---------------------------|------------------------------|-------------------------------|------------------------------------|---|---------------------------|---------------------------|
| <u>Sales Manager</u> | | | | <u>Office Administrator & Credit Controller</u> | | <u>Buying Officer</u> | | <u>Factory Manager</u> | | | | |
| Country Representatives | Warehouse Superintendent | Depôt Managers | Senior Town Salesman | Secretary | Accountant | Storeman | | Assistant Factory Manager. | | | | |
| Staff | | Staff | Town Salesmen | Foreman (Packing) | Despatch Officer | Clerical Staff | Admini- strative Staff | Staff | Main- tenance of Vehicles | Raw mater- ials Costing Staff | Mainten- ance Staff | Fore- men Staff |

3. It must be emphasised that though the position of having three Managing Directors is highly unusual, such was the case in this firm. Therefore, many decisions as regards policy are only made after informal consultations by all three Managing Directors have taken place. Despite this highest executive position being split up into three, there was not an undue amount of confusion as each of the Managing Directors confine themselves to one or other fields of the business activity of the firm.

MANAGERIAL ORGANISATION AFTER THE ADVENT OF THE EFFICIENCY EXPERT.

MANAGING DIRECTORS



Sales Manager. (Responsible to the Board of Directors).

1. The sale of the company's products.
2. The laying down of a sales policy, e.g. questions re discounts.
3. The assessment of potential markets and customers.
4. The fixation of prices for the company's products.
5. To investigate complaints of customers, and to inform the Chemist and Factory Superintendent, of the complaints.
6. To instruct all salesmen and depôt managers on matters relevant to sales.
7. To bring to the attention of the Directors information as regards packaging and quality of competitors' products.
8. To organise an annual conference of all sales personnel.

Note. As one of the Managing Directors of this firm assumes the role of Sales Manager, some of the duties enlisted above are the responsibility of the Assistant Sales Manager. Where this is the case the latter is responsible to the Managing Director in his capacity as Sales Manager.

Production Manager. (Responsible to the Board of Directors).

1. To ensure that production is carried out in the most economic manner possible, i.e. paying particular attention to works methods.
2. To ensure an equitable weekly work load for each department in the factory.
3. To schedule production, so that goods are supplied at the correct time, where they are wanted.
4. To keep in constant touch with the Sales Manager and Warehouse Superintendent, so that production is co-ordinated with consumers' demand.

5. To take charge and to operate the system of production control, e.g. ensuring that foremen deliver production according to schedule and that the weight of lines sold by count, i.e. penny, twopenny, threepenny lines etc., are kept constant. This point is extremely important as can well be imagined in the case of lines sold by count and not by weight.
6. The planning of factory production.
7. The organisation and control of the incentive wage scheme .
8. The preparation of a monthly report to the Directors on all matters relating to production.
9. The organisation and control of the cost accounting system.

Factory Superintendent. (Responsible to the Board of Directors).

1. The control of quality of the goods produced.
2. The investigation and development of possible new products.
3. In collaboration with the Production Manager, to control the labour force of the factory.
4. General supervisory duties such as ensuring that standard works methods are adhered to and that cloakrooms and canteens are kept clean.

Chemist. (Responsible to the Board of Directors).

1. To investigate complaints in regard to defective goods returned by customers.
2. To ensure standardisation of flavourings, raw materials and colouring.
3. In collaboration with the Factory Superintendent to make tests in regard to the quality of goods produced.
4. To advise the Production Manager of changes in recipes, batch sizes and other similar matters, so that the production information of the Production Manager can be kept up to date.

5. To report to the Directors as regards the purchasing of raw materials.
6. To supervise the working of the laboratory and to be responsible for all work involving chemical analysis and control checks.

Office Administrator and Credit Controller. (Responsible to the Board of Directors).

1. This position is filled by one of the Directors and entails the responsibility of the issue of credit to debtors, and general administrative duties such as the keeping informed of legal regulations, and advising the Secretary-Accountant on matters of policy.

Secretary Accountant. (Responsible to the Board of Directors and Office Administrator).

1. The organisation, control and running of the accounting system of the firm.
2. To ensure that the legal requirements of the Companies Act are complied with, particularly in regard to the preparation of final accounts.
3. Dealing with correspondence addressed to the Company.
4. To take control of all legal matters affecting the company, such as the summoning of debtors for overdue accounts.
5. To advise the Directors on matters of policy, particularly with regard to negotiations with the local sweet industry trade union.
6. To collaborate with the Production Manager in drawing up the overhead distribution sheet of the costing system.

Certified Engineer. (Responsible to the Board of Directors).

1. To see that the relevant sections of the Factories, Machinery and Works Act of 1941 are observed, e.g. regulations as regards safety compliances.

2. Organisation and control of maintenance staff.
3. To take charge of all factory machinery and to ensure its good working order.
4. To report monthly to the Directors on all the engineering activities of the firm.
5. To supply the Production Manager with the relevant information as regards maintenance costs, to enable the latter to draw up an accurate overhead distribution sheet.

Buying Officer.

This post is shared by the three Managing Directors, each specialising in one or other field of purchasing. For example, one Director is responsible for the purchase of maintenance equipment and machinery, while the others concentrate on the purchase of wrapping papers, raw materials etc. All purchases have to pass through the hands of one of the Directors for their approval. This has proved a great controlling measure and has resulted in many economies.

From the managerial structure chart it will be observed that this firm exhibits what at first may be considered to be a peculiar organisational set up. Firstly, the cost accounting system is under the control of the Production Manager and not the Accountant as is normally the case. The reason for this is that the Production Manager only joined the firm at the beginning of 1954 as an assistant to the efficiency expert. As this expert set up the various production systems (including that of costing), these systems were put in the charge of his assistant (later to be appointed Production Manager of the firm). In a similar way the incentive wage scheme came under his control.

Secondly, the fact that the positions of Sales Manager, Buying Officer, Credit Controller and Office Administrator are taken up by the Managing Directors, tends to confuse the issue slightly. This is particularly so in the latter case, where though the Secretary-Accountant is lower down the organisational chart, than say the Chemist, he is of the same executive status, if not more so, while the Office Administrator and Credit Controller is (in his capacity as such) at the same managerial level as other factory executives, e.g. the Chemist or Production Manager, who are in turn at the same level as the Secretary-Accountant. Thus there is the paradoxical position of the latter executive being of the same managerial status as the Office Administrator, while at the same time, being responsible to him.

The above difficulties, however, and others of a similar nature are largely technical and have no marked effect on the smooth running of the firm. The present managerial organisation (largely brought about as the result of the work of the efficiency expert) overcame many of the difficulties that were prevalent previously. For example all work orders now go through the hands of the Production Manager, who in turn informs the various foremen concerned of what is expected of them. As does sometimes happen, when a Managing Director (in his capacity as such), gives instructions to a foreman, the Production Manager is always informed of the matter. As a result there is no longer any duplication of orders, or the placing of foremen in the unenviable position of

having to obey two sets of conflicting orders from persons of higher managerial status. Though the improvement in organisation has been primarily effected as far as production is concerned, other improvements are well worth observing. For example, the appointment of a Chemist and of a Certified Engineer have very obvious advantages, while the appointment of assistants to the Directors (in their capacities such as Sales Manager, etc.) enables the Directors to concentrate more on the general running of the firm, rather than on any one particular section of the firm's activity.

CHAPTER 6.

PLANT AND DEPARTMENTAL LAY-OUT

AND

PRODUCTION FLOW.

INTRODUCTION.

With the completion of the building of an additional three storeyed wing in 1953, a great deal of attention was paid to departmental and plant layout. All personnel capable of advising on this matter, were consulted, with the result that the layout of the present factory has as a whole been extremely well thought out. Taking into account that such a large variety of goods are produced, it is submitted that the general factory layout, as distinct from the individual departmental layouts, cannot be improved upon. The complicating factor is that some departments deliver goods to two or more other departments so that it may appear in some instances as if the layout is poor. The marzipan department on the ground floor for example, delivers some of its products to the starch department which is on the third floor. On investigation, however, it will be found that to alter the position of the different departments in the factory may improve one fault, but cause several other defects. Regarding the layout of the individual departments, it is submitted that, on the whole, the position is satisfactory, though there are several very obvious errors of plant layout. Most of

these errors are of a minor nature and could easily be remedied.

Dealing in what follows with the question of departmental layout, and more particularly so of plant layout, the nature and method of the work carried out in each separate department has been briefly described, as well as the flow of production. Each department is dealt with separately so that an investigation can be made of the production flow in that department. The reason for this is that, if all the departments were to be drawn together, as they are positioned in the factory, it would result in the diagrams of the smaller departments (which might possibly have large amounts of machinery, e.g. the caramel department), being extremely cramped and would hinder a clear description and exposition of the internal departmental flow of goods. After each department has been dealt with separately, however, the inter departmental flow of goods will be illustrated by means of a diagram of the building, illustrating in which part of the building the different departments are situated in relation to each other.

Probably the most important problem in this factory apart from the diversity of products made, is the diversity of products made in each department. Thus to give a full description of the entire movement of all goods made in each department is an impossibility, and would lead to confusion. Therefore only the most important work carried on in each department has been described. In addition though, a certain amount of handwork is performed in several of the departments, e.g. in the chocolate department; but this work is of so little comparative importance

that though the diagrams of the different departments indicate where handwork is carried on, no description is given of the work. On diagram 4, for example, it will be noticed that there are a number of tables for handwork as well as various cooling cupboards. Because this work is usually carried on only in the winter months, involves a staff of only ten to twelve people and contributes about 5% by weight only to the output of that department, it has not been described.

Note 1. The diagrams of the layout of plant are in no way intended to be exact architectural blueprints, but are drawn approximately to scale, to illustrate the production carried on in each department.

Note 2. All raw materials are supplied by a store to all the different departments as and when they require them.

Note 3. The arrows employed to show the departmental flow of production have, as a rule, been drawn only where necessary, and not in obvious cases, e.g. from the raw material stands to the cooking pans.

Starch Department (Diagram 2).

This department produces the centres for chocolates, jubes for mixtures, and penny lines, such as sponge fish and motor cars.

Like all products made in this factory (except for solid chocolate), sugar and glucose are the prime ingredients and it is merely the degree and manner of boiling, and the proportion in which these two raw materials are mixed, which determines the type of sweet

to be made. Glucose (which is a viscous liquid) and sugar, are fed into two lots of boiling pans, "A" and "B" on the diagram. The output from pans "A" is fed into two creaming machines which beat up the mixture into a creamy mass and it is then stored in two tanks for future use. The material at this stage is called a fondant. Then if, for example, one hundred pounds of a strawberry cream is ordered from starch department, one hundred pounds of the fondant is weighed off, mixed in any vacant boiling pan with the proper flavouring and colouring, and sent to the large mogul. The output from boiling pans "B" is also sent to the large mogul.

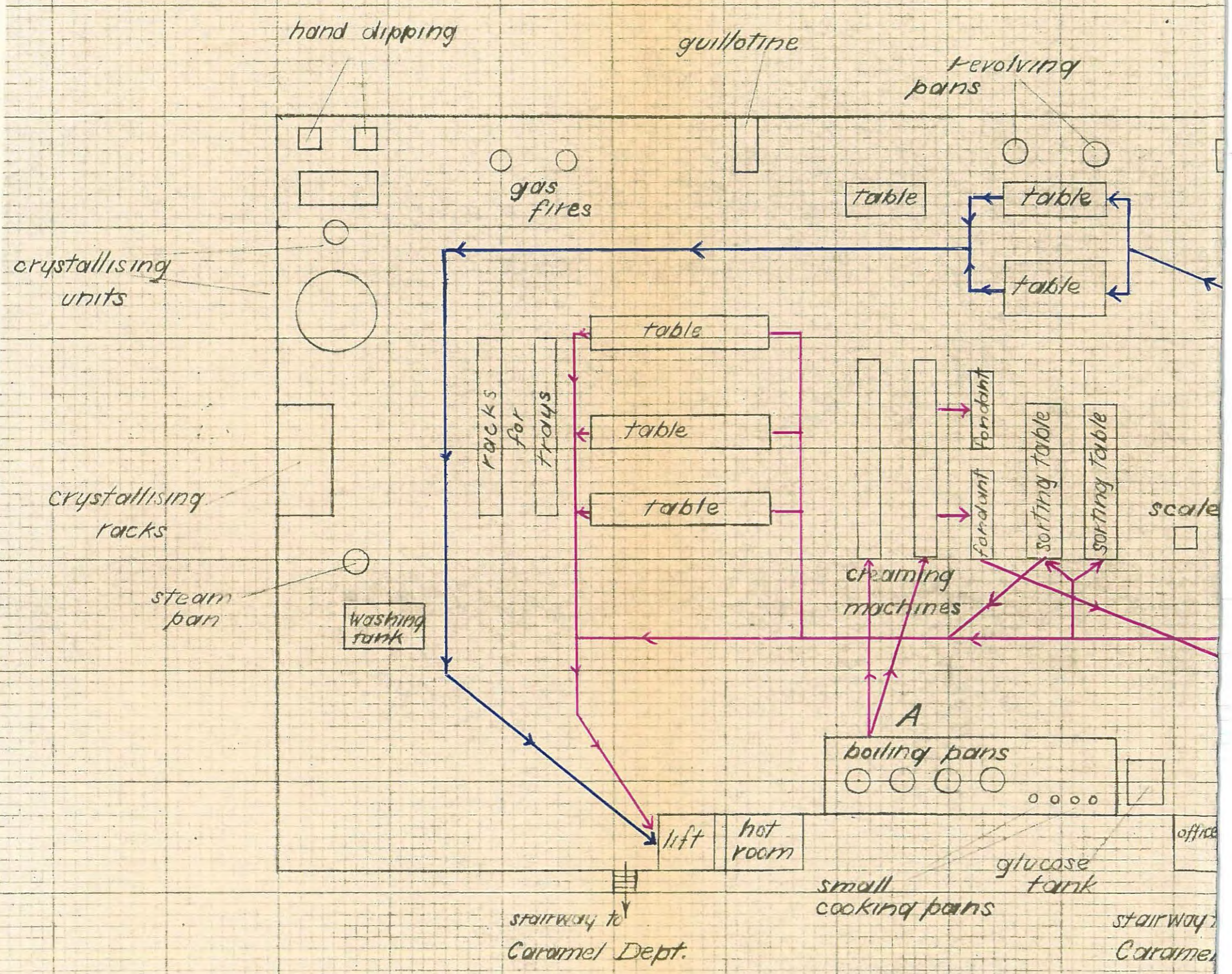
The mogul is a machine which operates in a complete circle as follows:-

Empty trays are loaded on the machine at the right-hand side; these trays move towards the left and as they do so, they are automatically filled with moulding starch. The starch is automatically levelled off in the trays and once again, automatically, the required impressions are made in the starch. At the extreme left of the mogul the creams from the cooking pans are loaded into the machine and pumped into the impressions made in the starch. The filled trays are then stored for a time to allow the product to set, after which the trays are again loaded on the extreme right of the mogul, automatically emptied, the trays are filled with starch again and the whole process repeated. This procedure is followed for all chocolate centres as well as for a variety of other sweets such as jubes.

From the mogul the sweets are loaded into boxes, taken to one of the sorting tables where misshapen pieces are removed, and then via the lift, downstairs to the chocolate department where the creams are covered in chocolate. In some cases such as jubes, the product goes to the sugaring tables where they are washed to remove excess starch still clinging to them and also to make them sticky. They are then rolled in sugar. The product is then taken, via the lift, to the packing department which is situated on the ground floor.

The other important product made in this department is penny sponge lines such as the universally known "sponge fish".

In making these sponge lines, the sugar and glucose after being boiled in pans "B", are taken to the two beaters in order to aerate the product - this ensures size (important from a sales point of view) - with a minimum weight of materials (important from a financial point of view). From here the product is sent to the small mogul which operates in exactly the same manner as the larger one. After the sponge lines have been manufactured on the mogul, they are taken to the packing tables where they are packed in gross boxes. The completed and packed goods are then sent, via the lift, to the warehouse. In some cases, however, such as the penny line called "apricots", the two halves have to be stuck together, as it is obviously impossible to mould a complete circle in the starch. From here the product is taken to the pans department for further processing.



It is submitted that the layout of the Starch Department (which covers the whole of the third floor of the new building), is extremely good, and the only equipment which merits movement are one or two of the items not even mentioned in the above description, owing to their extremely minor importance. It will be noted that generally the flow of goods is from the right to the left of the diagram.

Pans Department (Diagram 3).

This department can be divided into three sub-departments. Section A is a very small section, the main work of which is to supply the rest of the factory with sugared peanuts and peanut centres for chocolates. This sub-department is actually part of the caramel department, but as it is in the same block as the pans department it is convenient for purposes of illustration to deal with the layout here. Section B is the pans department proper; and section C is another small section in which liquorice products are made.

Section A. Sugar and peanuts are the basic two raw materials used here. The sugar is melted by low heat on either the gas or the oil stoves, peanuts are then added and after a while taken out and mixed with refined sugar in the crystallising bin. From here the peanuts are taken to one of the tables and packed and stored in tins till required. This sub-department also makes peanut centres for the chocolate machines, and here the procedure is identical to that as described above, except that a certain amount of glucose is used, and the peanuts in a

syrupy mass are poured from the stoves into the tables, allowed to harden, cut to the required size and sent to the chocolate department.

It is submitted that one great fault in the layout of this sub-section is that the raw materials are stored too far away from the stoves. Owing to the present layout of the equipment, however, the raw materials cannot be stored between the gas and oil stoves and the first tables (which would be the ideal set-up), as it would interfere to a very large extent with the movement of workers.

Section B. It is difficult to describe in non-technical terms, the work carried out in this department but it is possible, by means of example to illustrate the workings in this department. If one were to drop an object of any shape into one of the revolving pans (something similar in shape to a cement mixer) e.g. a pencil, after a time a hard coating of sugar would be built up around the pencil. Another example is a common line called "pink and white almonds" which are made by putting sugared almonds (obtained from sub-section A of the pans department) in the pans, pouring in the required amount of syrup from the sugar kettles and building up around the almonds, a hard coating of sugar, pink or white as the case may be.

The sugar kettles are supplied from the store of sugar and glucose, and in these kettles a syrup is made which is used to supply the revolving pans, there being no fixed rule as to which kettles supply which pans. The pans themselves are supplied with work, e.g. the penny

"apricots" from the starch department, and the syrup builds up around the lines - still preserving the original shape - but with an outer layer of hardened syrup. From here the goods are sent out of the department to be packed.

Another important section of the work is the making of different shaped lozenges and mottoes - the latter being a form of lozenge, cut in different shapes with wording on it. These lozenges are made entirely out of icing sugar with a small amount of a special gum solution to bind the product and a small amount of flavouring and colouring. The sugar is taken to the paste mixer where it is mixed with the three previously mentioned ingredients and put into the lozenge machine. They are then taken to the hot-room to dry, hence to the mixing table where the different shaped and worded lozenges or mottoes are mixed, packed into cartons and sent into the warehouse.

The main fault in this sub-section, it is submitted, is in the manufacture of lozenges where the icing sugar has to be taken from one end of the department right to the other end where the paste mixer is located. This can be overcome, however, by keeping a stock of icing sugar next to the paste mixer.

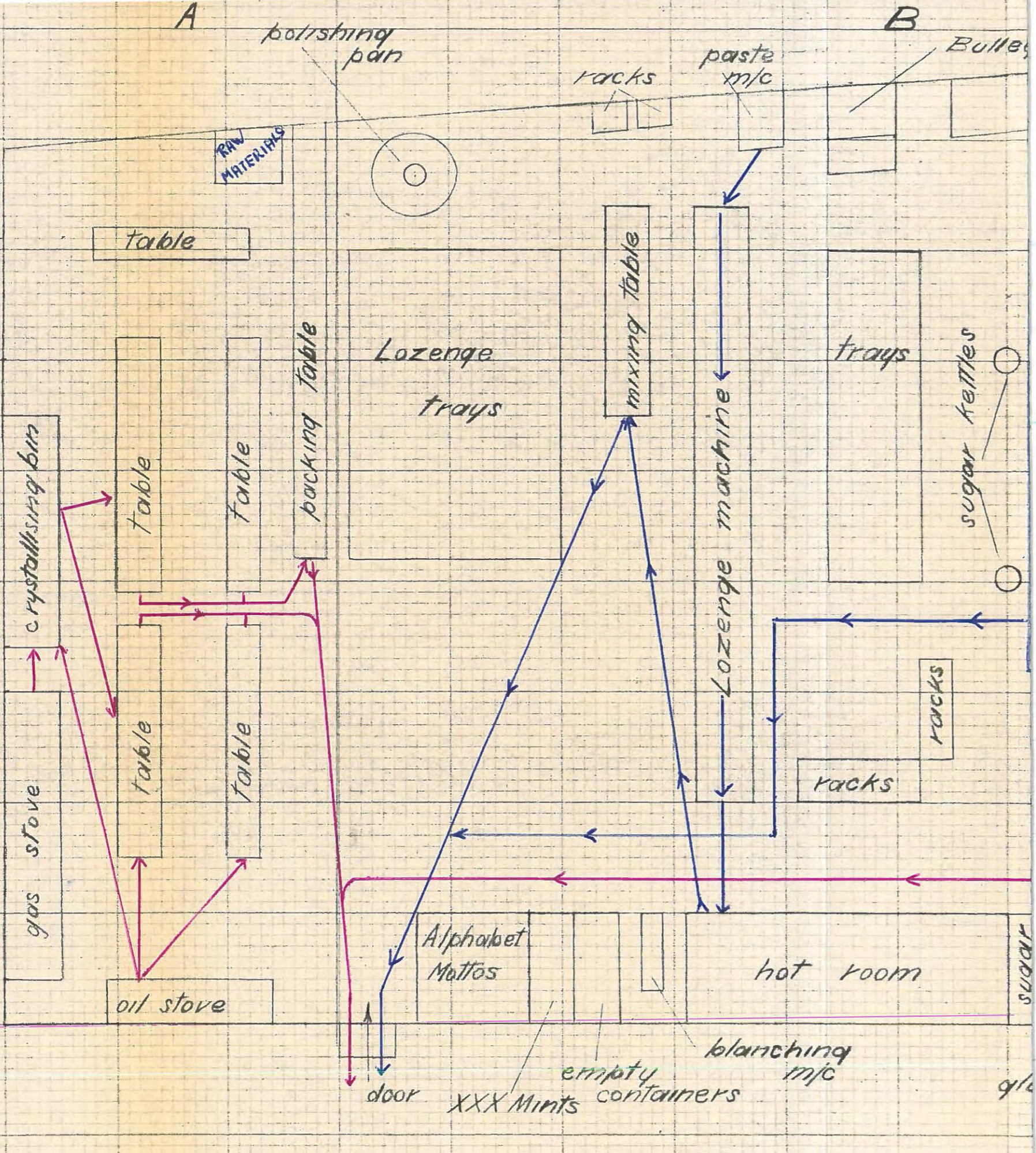
Section C. This sub-department manufactures all the liquorice that is required in the factory. The two liquorice pans are fed with raw materials, and then after boiling, the bulk liquorice is taken from the pans to the bin where it is stored until required. It is then taken to the liquorice machine where it is made into sheets,

"shoelaces" or "ribbons". Once the final product has been manufactured it is left to dry in the hot-box. When it is sufficiently dry the liquorice is packed at the tables or sent to marzipan department for further processing into liquorice allsorts.

There is one bad fault in plant layout here - namely that the liquorice pans ought to be situated above the liquorice bin so as to ensure a direct straight line flow in production. This would mean an alteration in the position of the liquorice hot-box so as to make room for the pans and raw materials, but the resulting smooth flow in production might make this move well worth it.

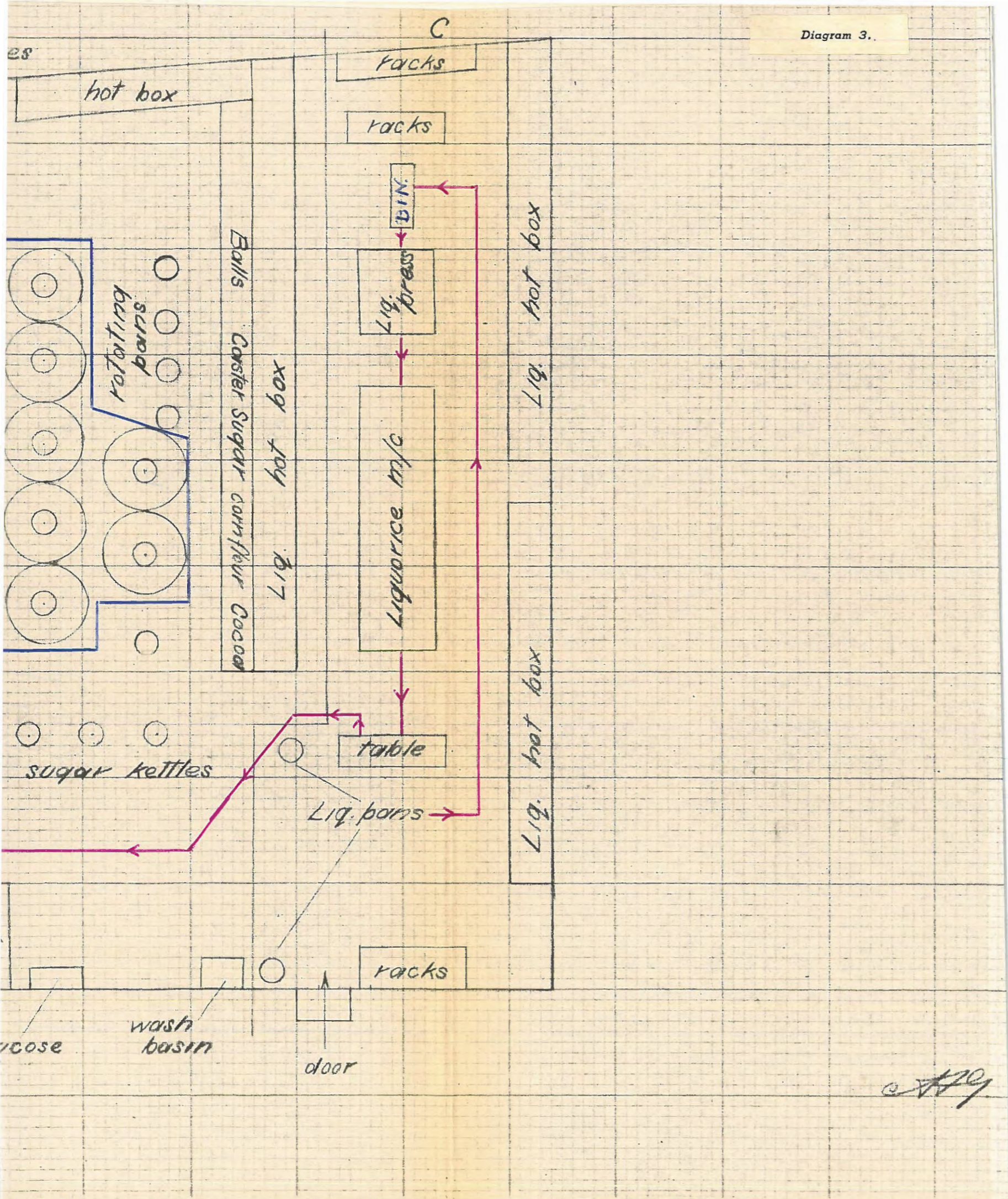
Chocolate Department (Enrobers) - Diagram 4.

The main work of this department is the covering with a coating of chocolate, centres received from other departments. The main machinery involved is the two enrobers, each of which consists mainly of a conveyor belt which moves from left to right. All the other equipment in this department is of minor importance, being used almost entirely for hand operations and contributes very little by way of weight to the output of the department. This equipment consists almost entirely of tables upon which the handwork is carried out. The only machinery which plays a fairly important part in contributing towards the output of the department, are the chocolate pans. These pans work in exactly the same way as the pans in pans department, only here, instead of coating the centre with a syrup, the centres are coated with



PANS DEPT.

Diagram 3.



Handwritten signature or initials.

chocolate. The main product made in these pans, is chocolate coated peanuts, which are afterwards polished and packed in the wrapping machines department.

The bulk chocolate is supplied from the chocolate mill in a separate building and kept warm in the chocolate kettles against the wall. The chocolate is then fed into the enrobers when required. The centres from other departments are first weighed and stored in the space for the temporary storage of centres and are fed onto the enrobers as they are needed. The centres are fed onto the extreme left of the enrobers and as the centres move along the conveyor belt, they are coated with chocolate, and cooled over the last three-quarters of the enrober, which is merely a cooling tunnel (in order to allow the chocolate coating to dry and set firmly). At the end of the enrober, the chocolates are swept by hand off the conveyor belt and into trays, which are then stored for a time until they are required by the foreman of the wrapping department.

The layout of this department as a whole, it is submitted, is extremely well thought out, the only flaw being that the present position of the scale involves a certain amount of double tracking of the centres to the enrobers, after the centres have been weighed. Unfortunately the scale cannot be moved to a more advantageous position without a major alteration in plant layout, as can be seen from the diagram, because of the lack of space anywhere else in the department in which to store the centres temporarily, after they have been weighed.

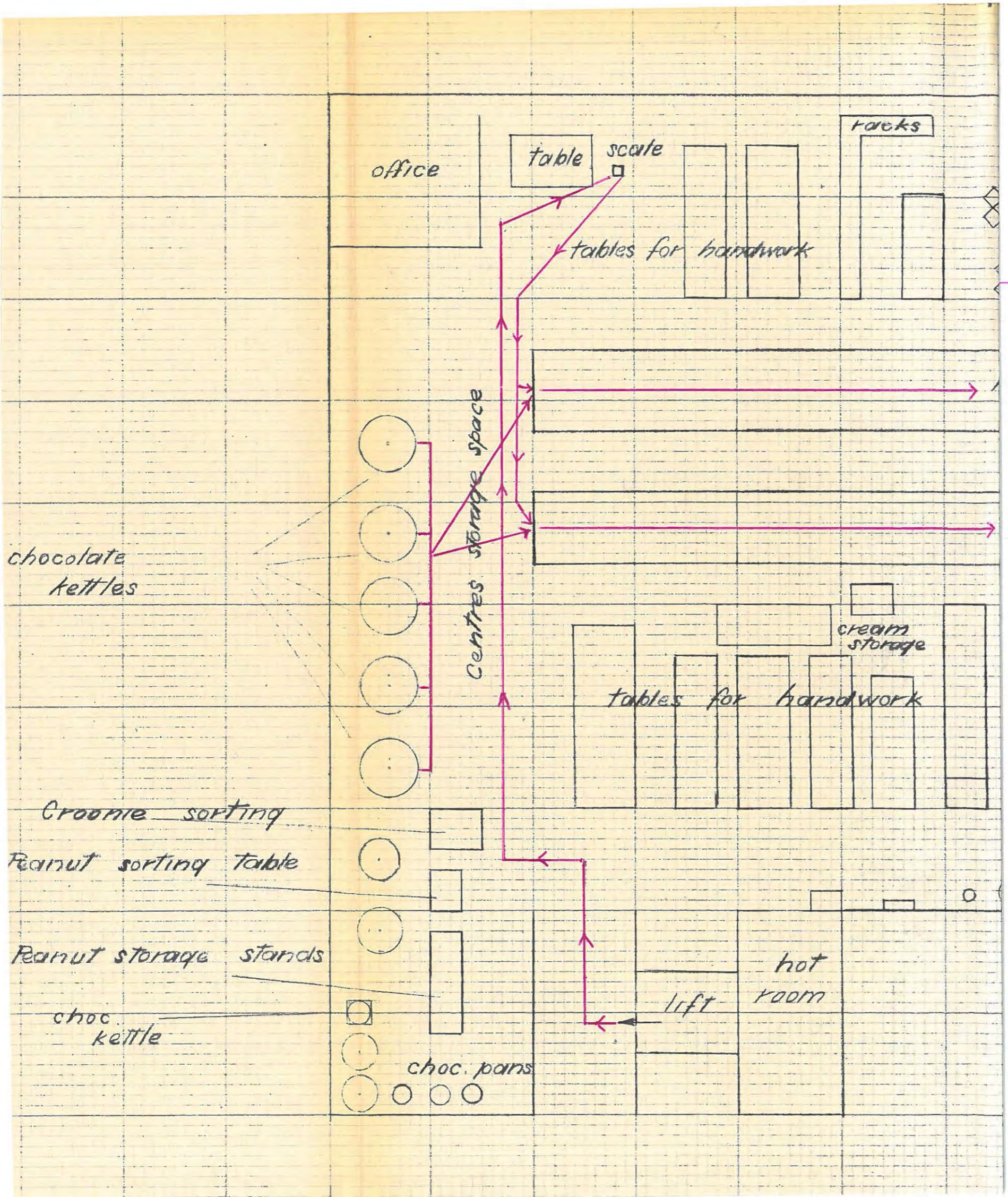
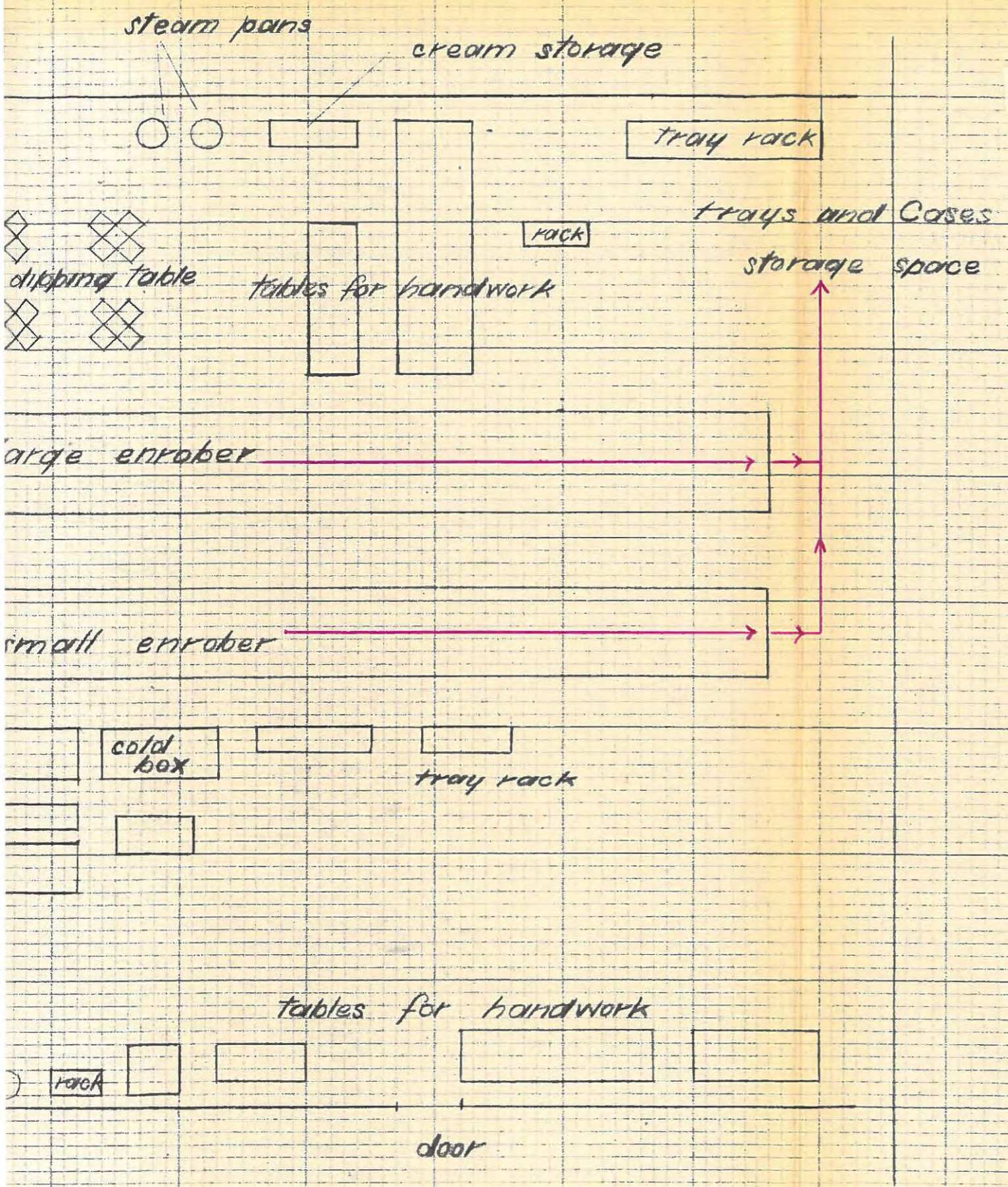


Diagram 4.



CHOCOLATE DEPT.

ALG

Wrapping Machines Department. (Diagram 5).

The work of this department can be divided into two broad classes - wrapping of chocolates in foil (colloquially known as "silver paper") - and the wrapping of boilings in cellophane.

The chocolates after being moved from the enrober are weighed on the scale and left to stand for a day (in order to allow the coating of chocolate to set really firmly), in the space reserved for the temporary storage of chocolates. The chocolates are then taken to the chocolate wrapping machines which though fed by hand, automatically wraps the sweets in foil. The chocolates are then taken by small conveyor belts on the machine and dropped into cardboard cartons, which when full are sent via the gravity chute to packing department on the ground floor. On examination of diagram 5, it will be noted that all the chocolate wrapping machines are facing the wrong way. This, however, is unavoidable as the machines cannot face the other way as the wrapped chocolates will then be offloaded from the wrapping machines into the same gangway as the output from the cellophane machines, thus leading to congestion in that gangway.

The other important machines in this department are the cellophane machines, which wrap the boiled sweets ("boilings") made by the firm. These sweets are made in the boiling department and are once again fed by hand into the wrapping machines, which automatically wraps the sweets in cellophane. About half the output of these machines are taken to the carton stock, where they are

packaged in cartons and thence taken via the lift in the chocolate department to the warehouse. The other half of the output of these machines are sent down to the packing department via the gravity chute, where they are used to complete one of the many assortments made by this firm. In addition to boiled sweets, a small percentage of the chocolates are wrapped in cellophane. This latter group of chocolates are used in assortments with other types of sweets and are not packed in chocolate selections.

One other machine of importance in this department is the peanut polisher, which is used to put "varnish" on the chocolate peanuts received from the chocolate pans. This machine is very poorly situated and it would facilitate production if it were placed in the chocolate department near the chocolate pans. This is a definite oversight and as soon as it is possible to re-arrange the equipment in the chocolate department to provide more room, this machine will be moved.

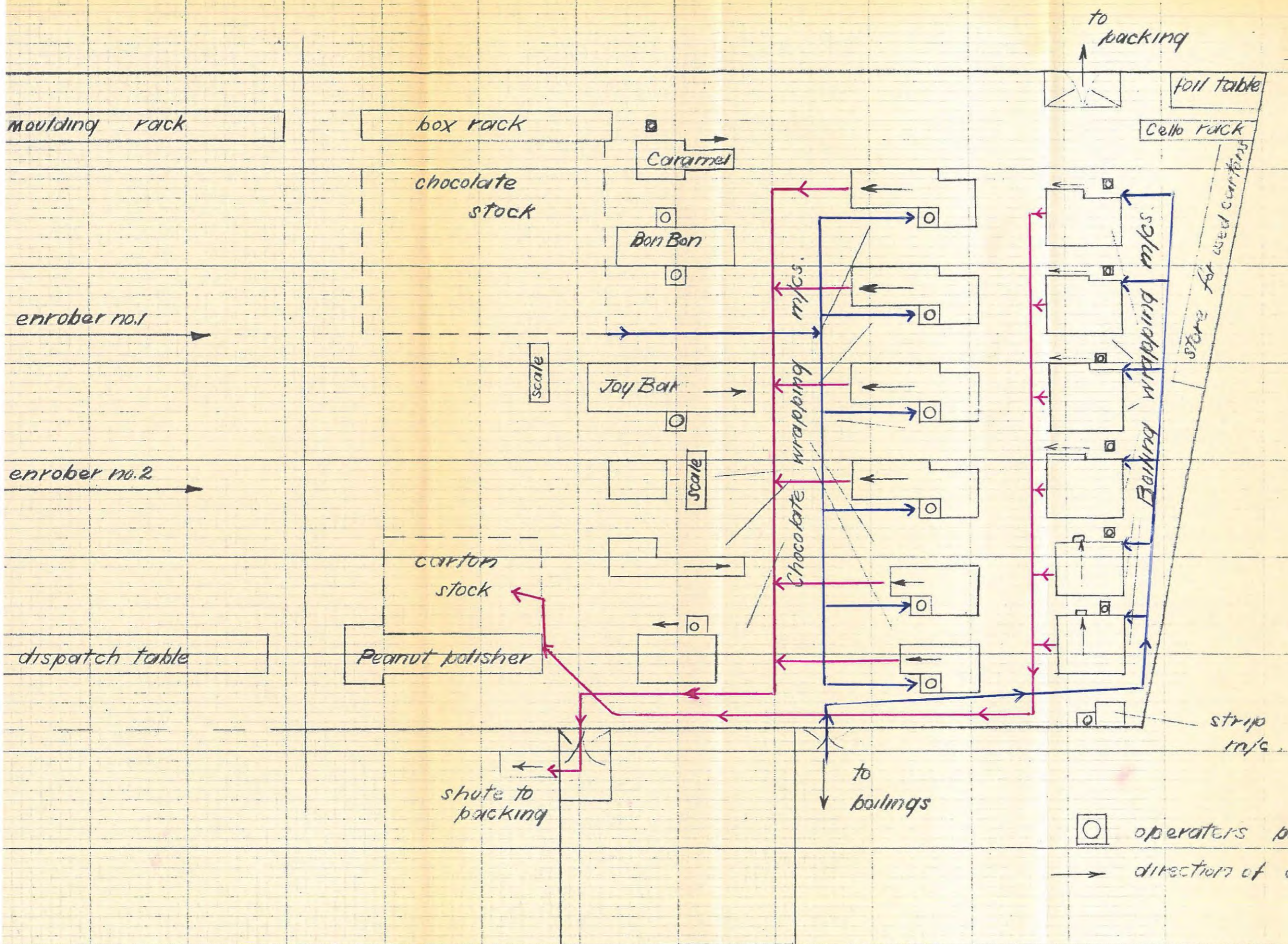
Boiling Department. (Diagram 6).

This department manufactures boiled sweets of all kinds. The output of the department can be divided into two groups:-

- a) those which are sent to the wrapping machines to be wrapped.
- b) those which are packed in the department itself.

The boiling up of the basic ingredients of sugar and glucose is slightly different in this department com-

Diagram 5.



○ operators position
 → direction of discharge

WRAPPING DEPT.

AG

pared with the procedure followed in other departments, in that the sugar is first dissolved in one of the steam pans, mixed with the glucose and then drawn into one of the vacuum cookers where it is boiled at a lower temperature than would otherwise be possible. The reason for this is that the sweet mass after being boiled, must be allowed to cool on one of the tables before being fed'td, the machine which actually makes and shapes the sweet. If they are allowed to stand too long a time, the sweet mass becomes discoloured. Thus the vacuum cookers by enabling the mass to be boiled at a lower temperature shortens the duration which the mass has to cool on the table.

a) Boiled sweets for wrapping department. This consists of two types:-

- 1) Boilings with centres such as jam or chocolate.
- 2) Solid boilings.

In the former case the raw materials for the filling are stored with the other raw materials. These are then taken to the steam kettle where the filling is flavoured and boiled. From here it is taken to the rostoplast machine (a machine which automatically makes boiled sweets and pumps the filling into them) though, this machine can be used to make solid boildings. The outer casing for the filling is once again made of sugar and glucose which are dissolved together in the steam pan on the left of the micro-cooker and then fed into the latter machine. The micro-cooker is a type of vacuum cooker which is fed continuously and enables the sweet mass to be drawn off

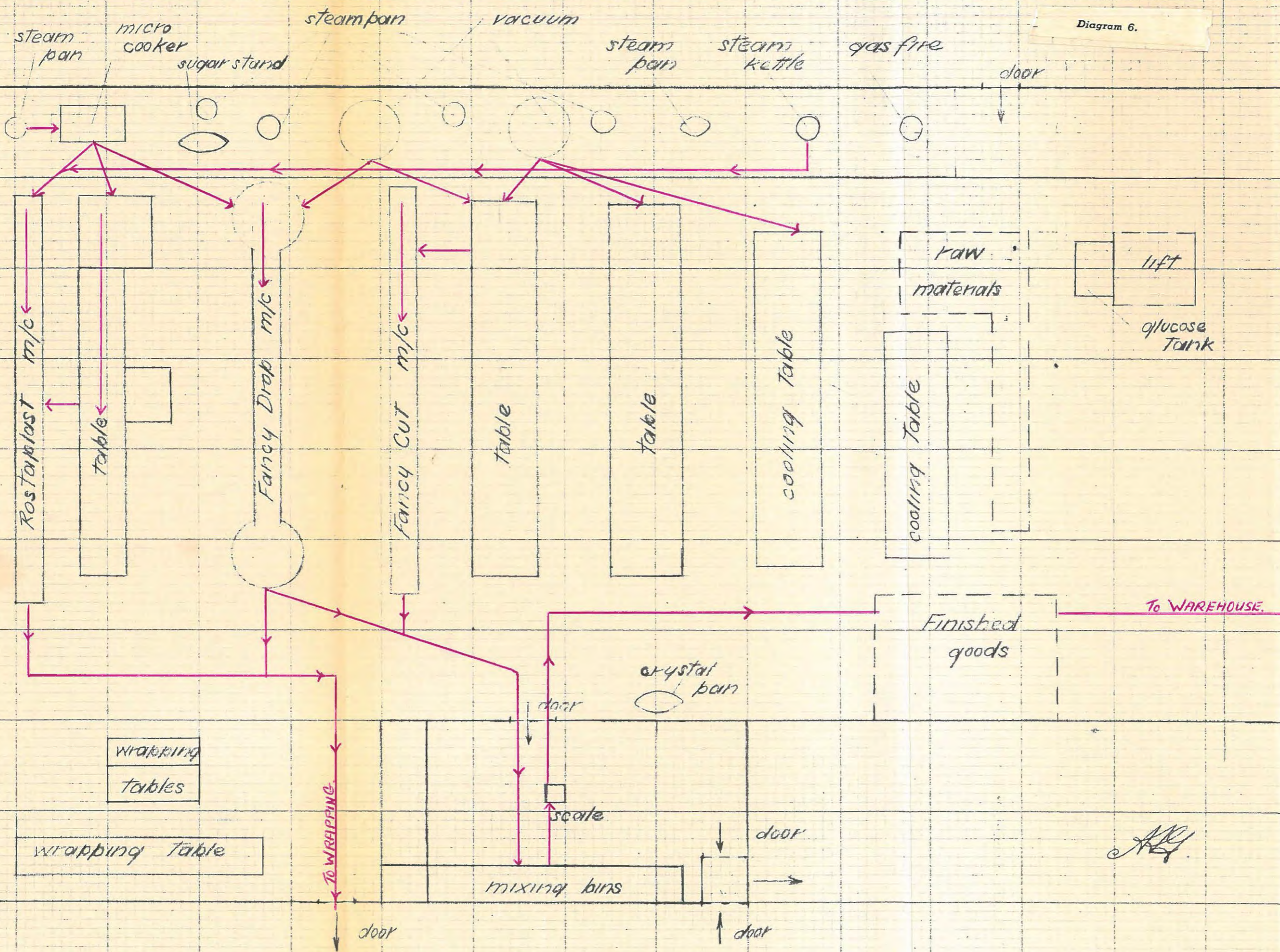
it continuously - thus there is always a sweet mass ready to be processed. A fixed weight of the sweet mass is then drawn off the micro-cooker, allowed to cool on one of the tables and fed into the rostoplast. This machine then manufactures the individual sweets which after being allowed to cool are taken to the wrapping department to be wrapped in cellophane and packed. Some of these sweets are also packed in the boiling department packing room and sent to the warehouse.

As a rule the solid boilings are made on the "Fancy Drop" machine, which is also fed from the micro-cooker or one of the vacuum cookers. The bulk of the output from this machine is packed in the department but a small proportion (about 10% - 15%) is sent to the wrapping department.

b) Sweets packed in the department. In addition to some of the previously mentioned sweets from the rostoplast and fancy drop machine which are packed in the department, sweet mass is drawn off one of the vacuum cookers and fed into the "Fancy Cut" machine after it has been cooled on the tables. This machine manufactures a variety of boiled sweets, colloquially known as "Bulls-eyes" which are then taken to the packing room of the boiling department to be packed in cartons.

In addition to the above type of work, this department produces sugar sticks which are wrapped at the wrapping tables, centres for the chocolate department and other minor products which contribute in only a small way to the output of this department.

Diagram 6.



BOILING DEPT.

It is submitted that the department is as a whole well laid out, except that the present layout makes no provision for the storage of raw materials at convenient points in the department. A result of this can be seen in the extremely poor situation of the glucose tank and the fact that, though the sugar is stored conveniently near the vacuum cookers, its present location does at times lead to unnecessary congestion. Once again the solution lies in the re-arrangement of certain plant, which at present is not thought to be worth while for the results that it would achieve.

Caramel Department. (Diagram 7).

This department has more machinery than any other department in the factory. Ninety-five percent of the output of this department consists of toffees which are wrapped in cellophane or waxpaper, or toffees which are sold by count i.e. two, three or four sweets for a penny. In addition to the above type of work, this department also manufactures caramels (a type of unwrapped toffee - square in shape) and centres for the chocolate department. This type of work, however, represents a negligible proportion of the output of this department. It is of considerable interest to note that this department, which is one of the smaller departments in size, contributes about a third by weight of the entire factory output. The reason for this is that this department is highly mechanised - practically no hand-work being performed at all.

The four main raw materials used in the manufacture

of toffees are condensed milk, vegetable fats and once again, sugar and glucose. These four ingredients are boiled in any vacant boiling pan to the required temperature and then taken to one of the cooling tables. The hot toffee is then cooled by draughts of air blown onto the tables. In some cases the toffee is poured into metal trays which are stored in the movable racks (a) and (b) on the diagram. This is done solely to overcome the problem of shortage of space as this department is extremely cramped. After the toffee has been allowed to cool for a certain time, it is taken to one of the toffee wrapping machines which automatically cuts the toffees into individual pieces and then wraps each individual piece in either wax-paper or cellophane. Machines number 1 to 7 inclusive all make count lines. These lines are packed by hand, straight from the machines into boxes of two, three or more gross each. These boxes are then packed in large outer containers and taken by lift down to the warehouse.

The other important work carried out in this department is the manufacture of assorted toffees either for mixtures of for packing in twenty-five pound containers. This work is carried out on machines numbers 8, 9, 10 and 11 on the diagram. The procedure is identical to the manufacture of the packed toffees except that as the toffees come out of the machines wrapped, they are allowed to fall into large wooden boxes and thrown into the bins where they are allowed to cool. From here to toffees are packed in cartons which are taken to the scale to be weighed, sealed with gummed paper and sent to the warehouse. In the case of toffees which have to be sent to the packing department

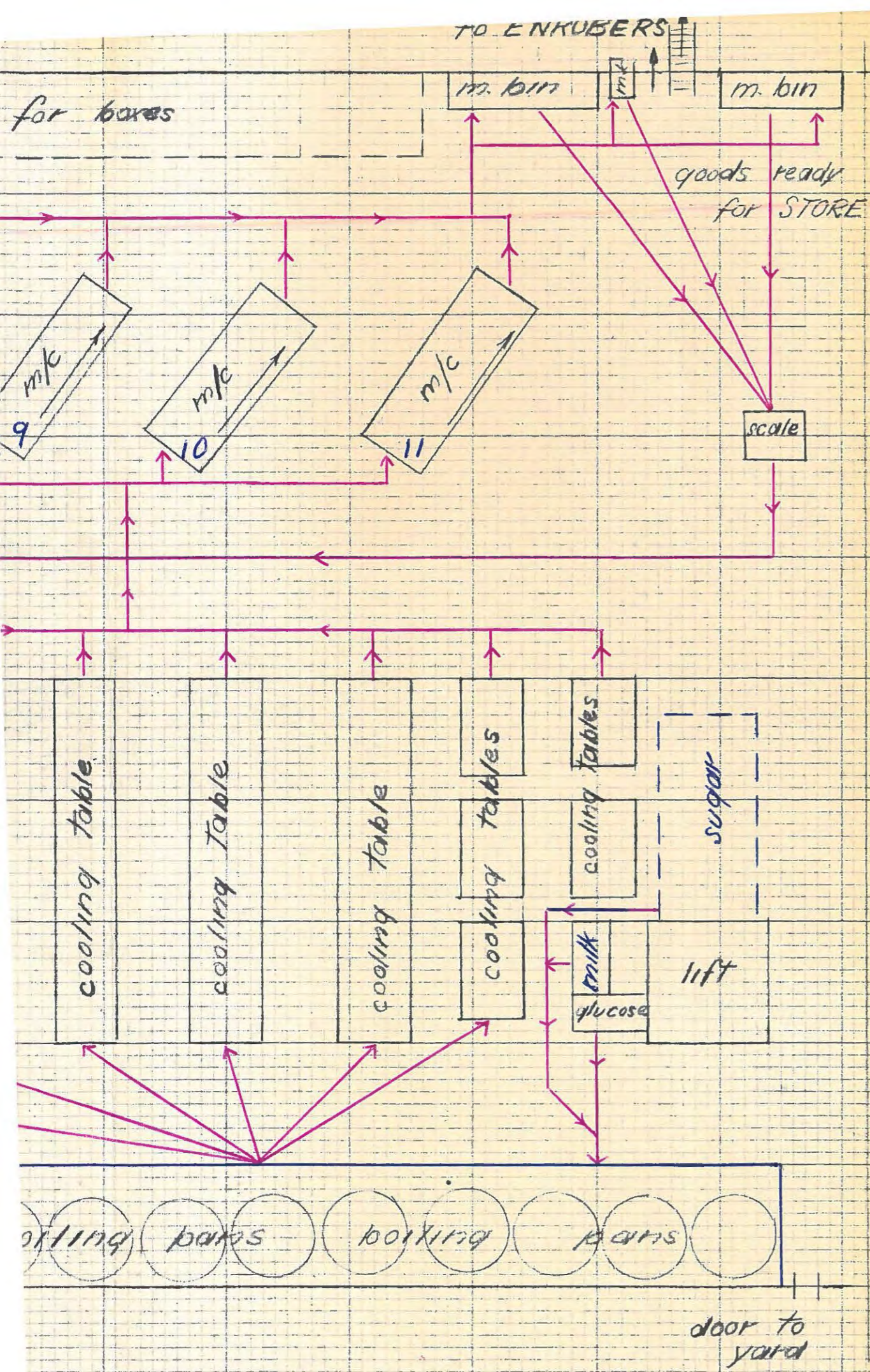
to be mixed with other varieties of sweets to form one of the many mixtures made by this firm, the procedure is identical except that the toffees after being allowed to cool in the bins, are thrown into wooden boxes and sent downstairs to the packing department on the ground floor.

Only two other varieties of sweets are made in this department, namely, centres for the chocolate department and caramels. These varieties of toffees are made in that part of the department corresponding to the bottom left-hand section of the diagram between machines numbers 1 and 2 and rack (b). Most of the machinery is used to size the toffee into sheets of equal thickness and to cut up these toffee sheets into different sized squares or rectangles, as is required. Because of the greater proportion of handwork involved in this type of work, these varieties of toffees are more expensive to produce and, even if the question of expense were to be ignored, there is still the problem that the output of this type of toffee can at the best only be very limited.

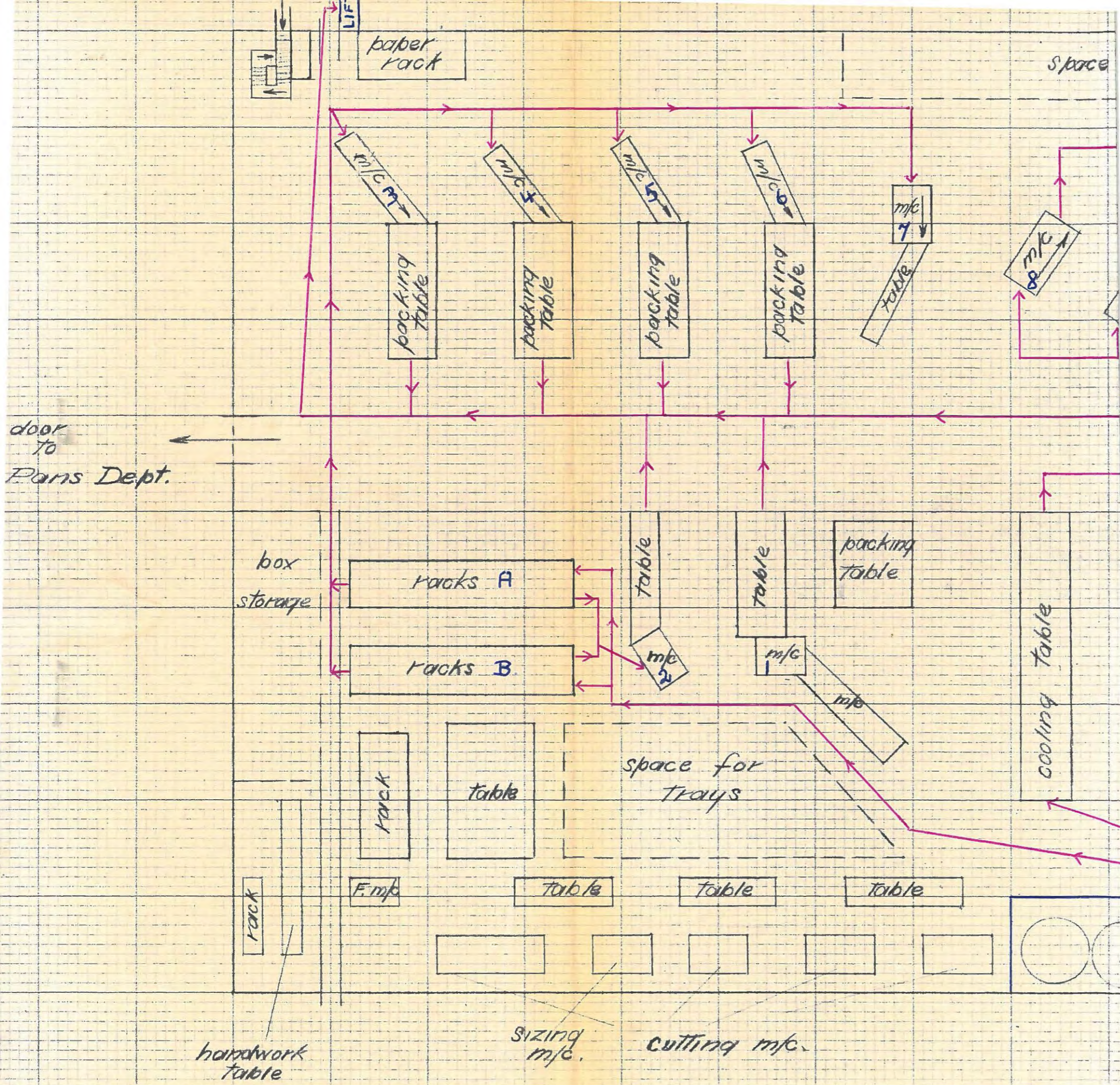
This department, it is submitted, is probably the worst laid out in the factory because of the following three main reasons:-

1. It is extremely cramped for space;
2. Machines numbers 3, 4, 5, 6 and 7 are obviously facing the wrong way. It would be far better if the machines were next to the passage and the packing tables against the walls. This would facilitate the loading of the bulk toffee into the machines;
3. The output from machines 8, 9, 10 and 11 move in a rightward direction on the diagram and then has to double back to the lift after the toffees have been

Diagram 7.



[Handwritten signature]



packed in cartons. It would be better if the toffees moved directly towards the left and were then packed and sent by lift to the warehouse. This would involve moving the bins and the scale, something which at present is not possible because of lack of space. It is hoped, however, that shortly a major alteration to the building will be undertaken, which will permit the caramel department to be expanded to nearly twice its present size.

All the faults in regard to the layout of this department are a direct result of unplanned expansion. Originally no thought was given to future expansion and as additional machinery was installed, room was made for this additional machinery by shifting other machinery about slightly. Naturally, after a time the position became serious as all the available space was used. Thus today it is only possible to install additional machinery if either a major building alteration is undertaken, or by the removal of old machinery. As mentioned in the previous paragraph it is hoped that the former alternative will be taken in the near future.

Marzipan Department. (Diagram B).

The production of this department can be divided into three groups:-

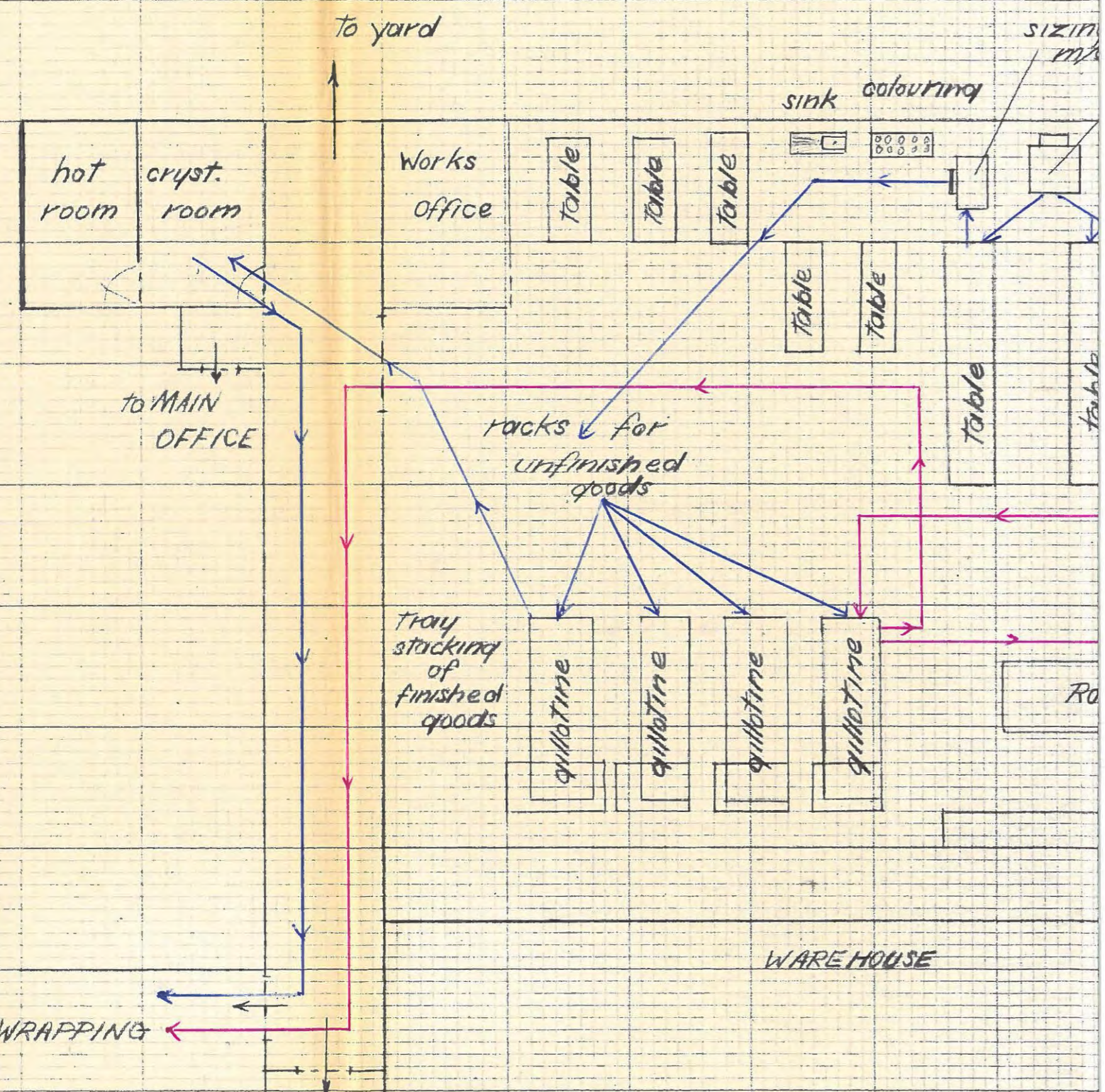
1. The manufacture of centres for the chocolate department;
2. The manufacture of marshmallows and nougat;
3. The manufacture of marzipan pastes for cheap mixtures, e.g. Liquorice Allsorts.

This latter group constitutes well over 75% of the output of this department.

In regard to groups (1) and (3) the procedure is identical - icing sugar, glucose and a special marzipan paste are mixed in one of the mixers and then taken to one of the tables where the mass is allowed to set. From here the paste is taken to the sizing machine which regulates its thickness. The paste is then stored in movable racks until it is required to be cut into squares or rectangles on one of the guillotines. The centres for chocolates are then thrown loose in shallow trays (to avoid crushing), whilst the marzipan pastes for the mixtures are thrown loose in wooden boxes and sent to the packing department.

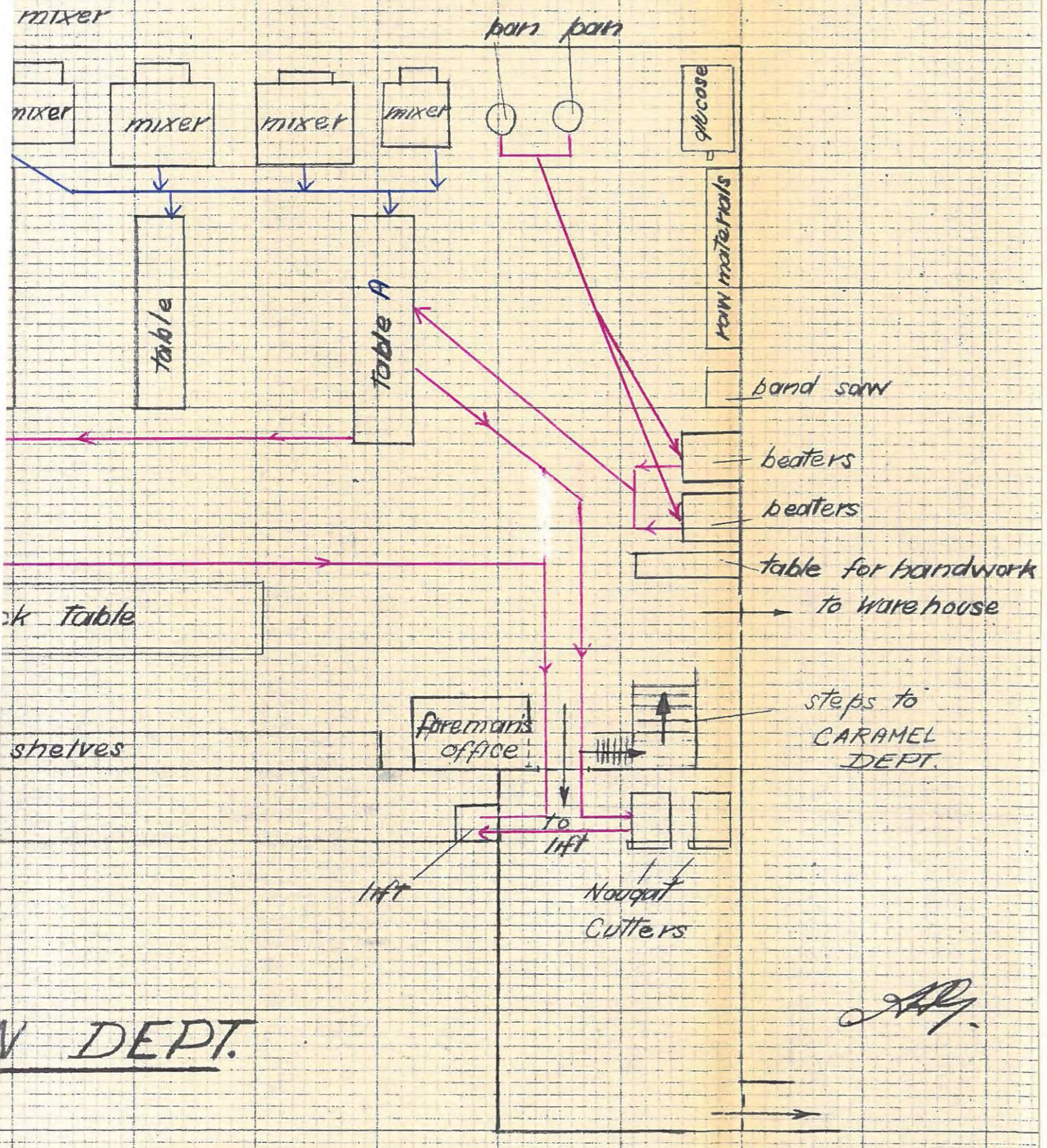
As regards group (2), i.e. the manufacture of nougat, and marshmallows, the procedure is somewhat different. The ingredients are first boiled in one of the pans and then beaten up into a very light, extremely viscous mass in one of the beaters and then poured into trays at table A, allowed to set for a day and then cut either on the guillotine in the case of the marshmallows, or on the nougat cutters in the case of nougat. These products are then sent to the packing department (or to chocolate department in the case of nougat centres for chocolates) where the sweets are packed by weight, in the case of marshmallows, and by count in the case of nougat. The general flow of goods in this department is in a diagonal direction from the top right-hand corner of the department to the bottom left-hand corner as illustrated on the diagram.

The plant layout in this department is considered to be satisfactory, the only problem being that the purchase of an additional beater would facilitate the production of nougat and marshmallows. This extra beater, however, would



MARZIPAN

Diagram 8



only be used in extremely busy periods as the two beaters are at present sufficient for normal requirements. Because this beater would be needed only at busy periods, the Directors of this firm have not thought it wise to incur the extra expense.

Packing Department. (Diagram 9).

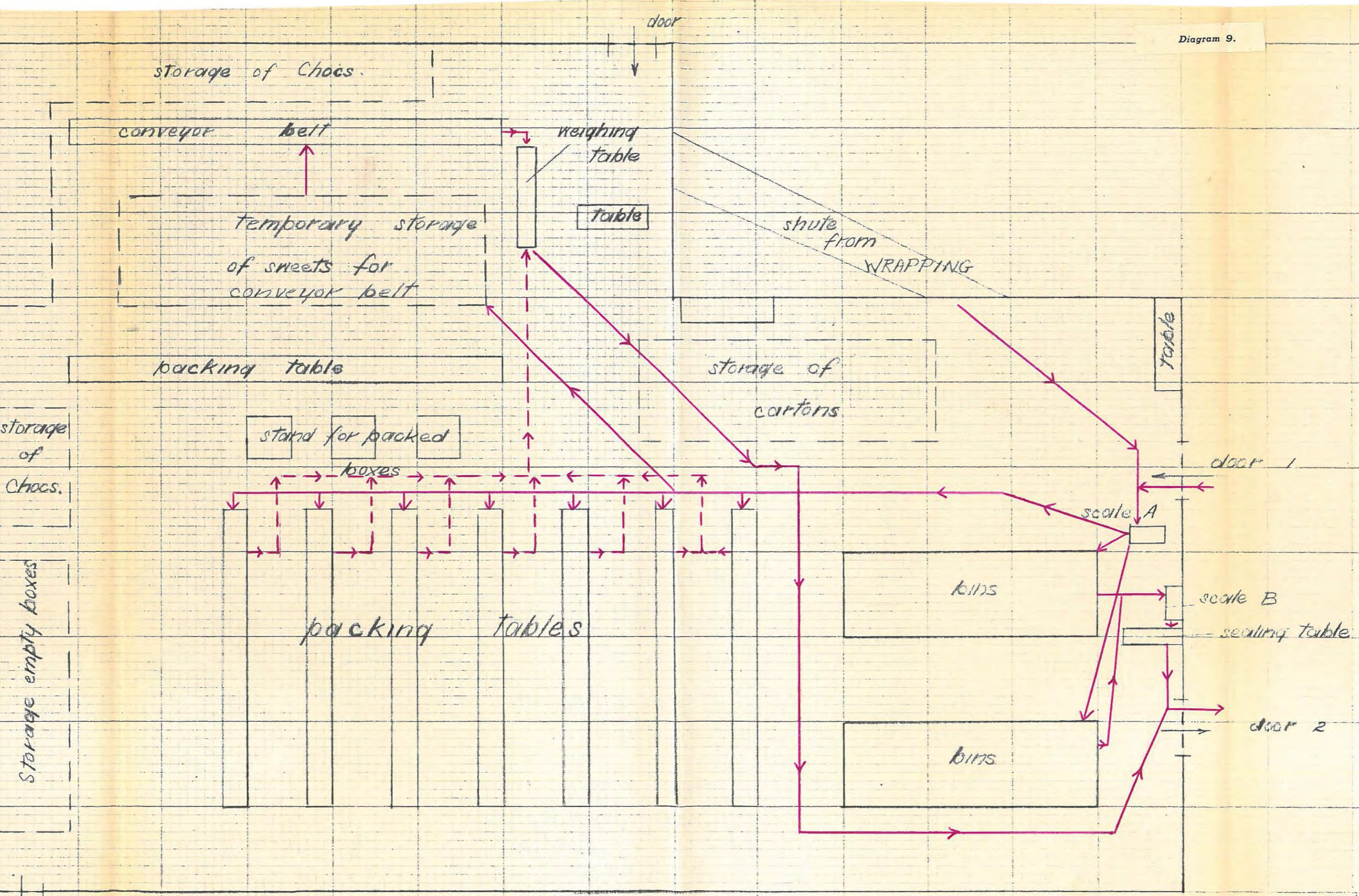
As the name implies, the work of this department consists of the packaging of the products made in the factory. The work can be divided into two classes:-

1. Sweets packed by hand into boxes or packets;
2. Mixtures thrown on one of the two bins.

In the former case the sweets either enter the department through door 1, e.g. the nougat received from the marzipan department; or via the chute from the wrapping department, e.g. wrapped chocolates. All sweets are first weighed on scale A and then they are taken to the tables, where they are packed. In some cases, the sweets are packed on the conveyor belt, then weighed at weighing table 1 and sent via door 2 to the warehouse.

In the case of mixtures (which also come in through door 1 or via the chute from wrapping department), the different sweets, after being weighed at scale A, are thrown on one of the bins, packed by hand into cartons and sent to scale B. Here the weights in the carton are adjusted to the desired weight, the carton closed at the sealing table and sent via door 2 to the warehouse.

Diagram 9.



PACKING DEPT.

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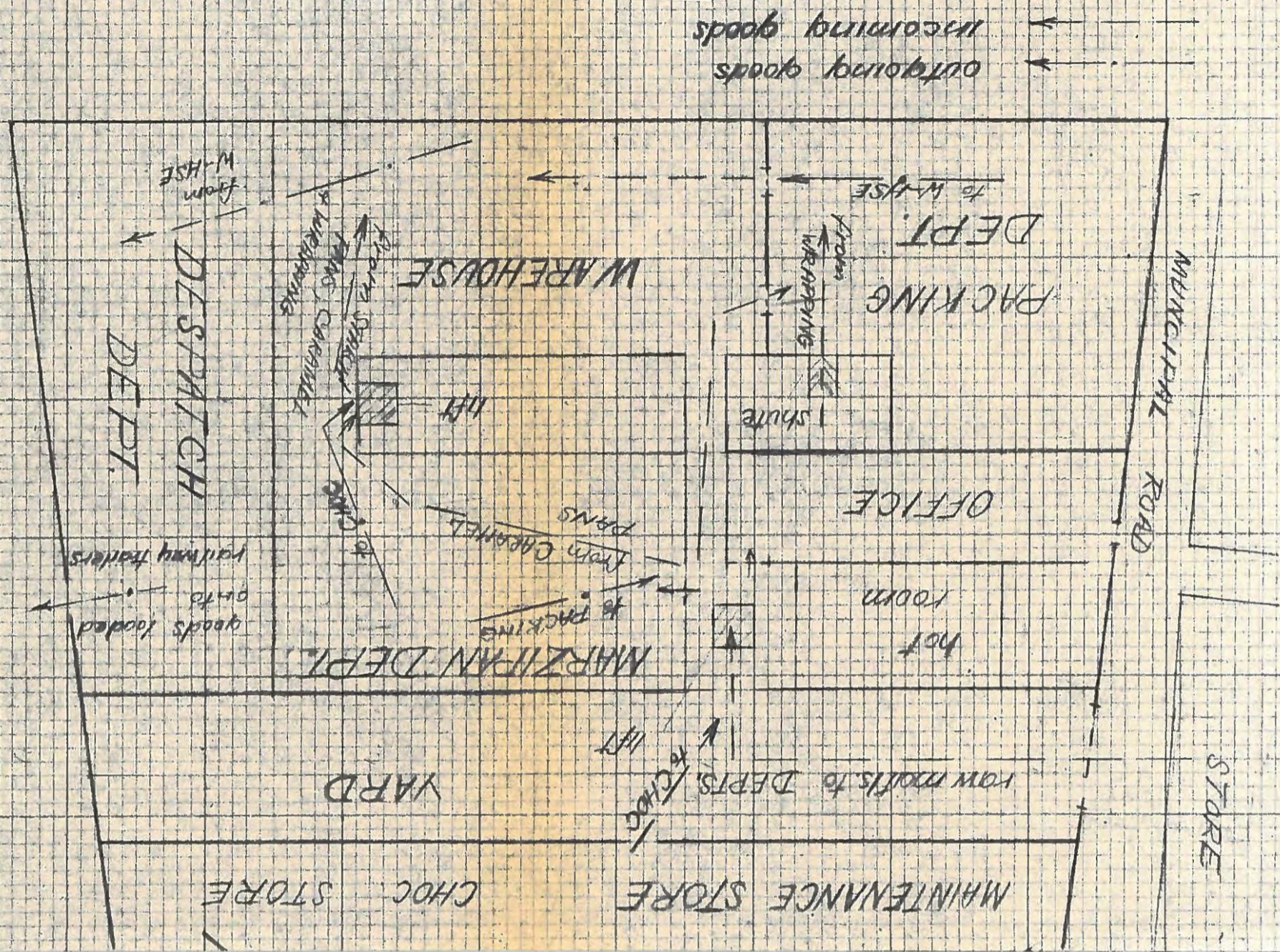
If diagram 9 is examined, it will be found that, other than for the conveyor belt and the two bins, the equipment in this department consists entirely of tables. Largely as a result of this departments' equipment being movable, the layout of the department is extremely flexible and consequently no problems of layout have resulted. Generally the flow of goods is in a circular direction, in through door 1 and out through door 2. The only problem that does arise is at busy periods of the year when the ground space immediately surrounding the two bins becomes congested with different sweets for the mixtures and the movement of workers is, to some extent, hampered. This, however, it is submitted, is not too serious a problem because the recently introduced planning methods have eliminated the possibility of goods having to remain in packing department for any great length of time.

Inter-Departmental Layout.

The layout of the different departments in relation to each other is indicated on diagrams 10, 11 and 12, representing respectively the ground, the first and the second floors of the building. The main concern in drawing up these diagrams has been to show the flow of goods from one department to the other. Each floor of the building has been drawn on a separate diagram so that the position of one department on one floor can be determined in relation to another department on a different floor, for example the situation of the marzipan department on the ground floor can be seen in relation to the chocolate

SCALE 1" = 50'

GROUND FLOOR



incoming goods
outgoing goods

from W-HOUSE

to W-USE

DEPT. DISPATCH
DEPT.

WAREHOUSE

DEPT. PACKING

from WAREHOUSE
to WAREHOUSE

shute

OFFICE

HOT ROOM

MARTIAN DEPT.

goods loaded onto railway trailers

PRINTS from CARAMEL

from CARAMEL

YARD

raw materials to DEPTS.
to CHOC

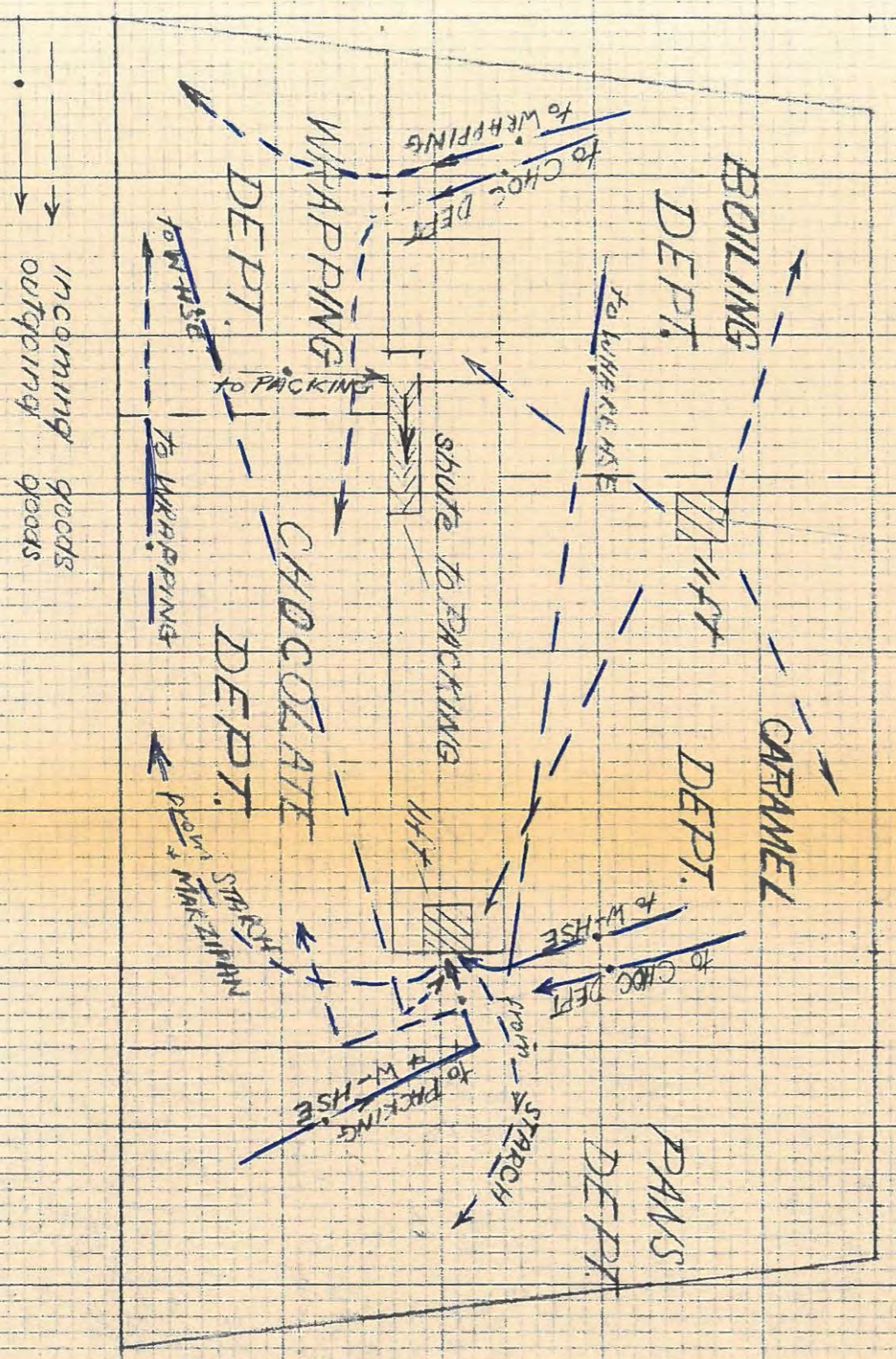
MAINTENANCE STORE

CHOC STORE

STORE

MUNICIPAL ROAD

Diagram 10.



RAW MATERIALS FROM STORES
TO OIL DEPT.

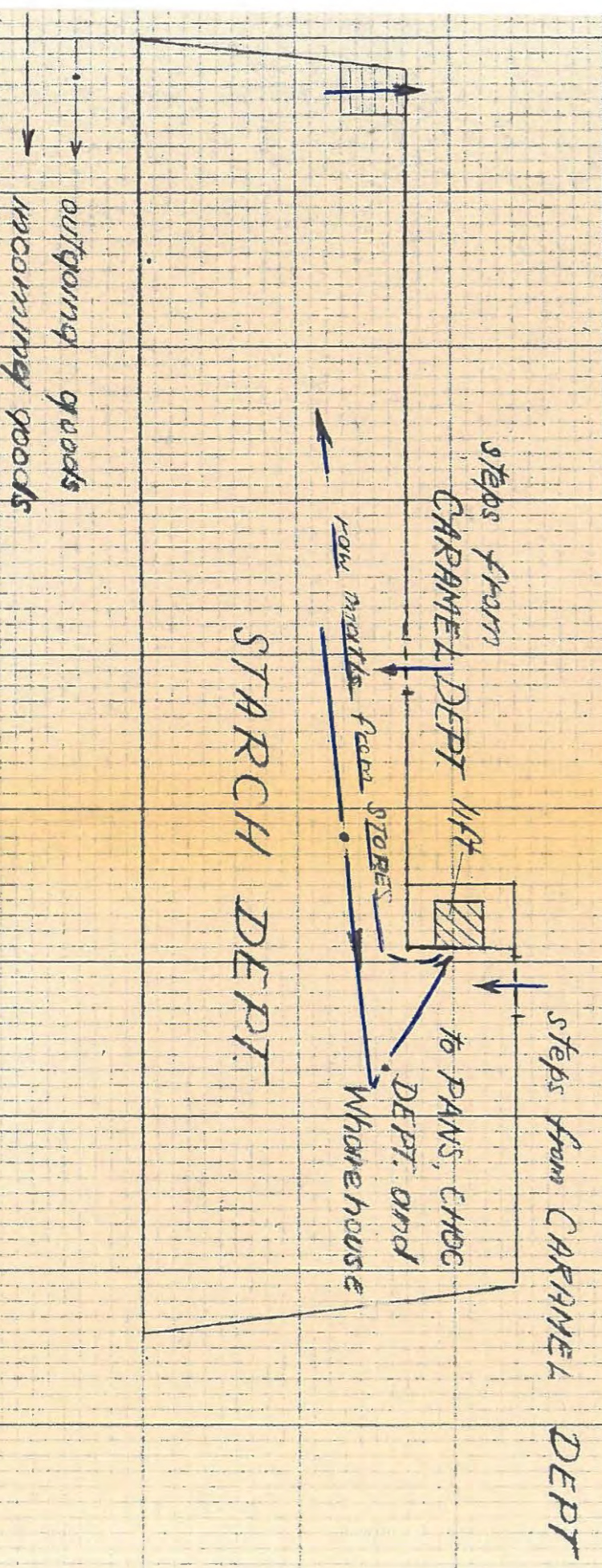
Diagram 11.

FIRST FLOOR

SCALE : 1" = 30'

2/1/54

Diagram 18.



SECOND FLOOR

SCALE 1" = 30'

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department on the first floor. Broken arrows have been used to illustrate goods (either raw materials or semi-processed products) coming into the departments, whilst continuous arrows (plus dots for purposes of clarity) have been used to exhibit the flow of goods leaving any department.

These diagrams are drawn approximately to the scale of one inch being equivalent to thirty feet though for purposes of convenience, cloakrooms, canteens etc. have been omitted as they have no direct bearing on the inter-departmental flow of goods. Consequently, the size of some of the departments has been slightly exaggerated owing to the absence of any cloakrooms etc. on the diagrams. The diagrams, however, accurately illustrate the relationship of the different departments to each other.

It will be noticed in many cases that goods have to travel through other departments before they reach their destination. For example, some of the boiling centres from boiling department have to be sent to the chocolate departments via the wrapping department. This instance, though unfortunate, is unavoidable, it being agreed by all senior factory personnel that the present position of the boiling department is extremely suitable owing to the immediate proximity of the wrapping department which wraps over 40% of the output of the boiling department. Similar instances also occur in regard to other departments, but as mentioned earlier in this chapter, this is one of the problems inherent in any multi-product factory where departments are inter-dependent on each other.

In conclusion, it is submitted that, though many minor faults of plant layout exist in this factory, most of them are of relatively minor importance or else are unavoidable. With the one possible exception of the caramel department, plant layout in the various departments has been well planned and many of the possible difficulties which could have occurred, have been avoided.

CHAPTER 7.

METHODS OF
PRODUCTION PLANNING AND CONTROL.

1. Production Planning Methods Employed in the Factory.

Stock Record Cards. The whole method of planning introduced into the factory by the efficiency expert vide chapter 4, last paragraph, revolves round these cards, which record the stocks of finished products in the warehouse at any moment of time. Prior to the advent of these cards, the Warehouse Superintendent, before drawing up a list of what goods he required and handing the list to the Factory Manager, had to observe physically, what goods he required in the warehouse. In addition to the normal difficulties involved in taking stock where so great a variety of products are produced, there was always the additional danger that, if a line was out of stock, the Warehouse Superintendent would omit to order it, there being nothing to remind him to do so. A further difficulty was that, as requirements were made up twice weekly for submission to the Factory Manager, the Warehouse Superintendent spent most of his time taking stock in a rough, ready and inaccurate way. Inevitably he had to submit a large number of "rush orders" whenever he found himself out of stock of a particular line.

With the introduction of the stock record cards (Form A), the above position altered radically. The

system of writing up these cards, though simple, is very effective. Under the first column "Received" (abbreviated to rec'd), all quantities of the specific line received in by the warehouse are entered, the date on which the product is received being entered into the second column. The third column is not generally used, except possibly for the making of remarks by the Warehouse Superintendent as to how many truckloads of the line were received on any specific date. The fourth column, "Quantity Issued", (abbreviated to Quan.) is used for entering up all amounts of the particular line sent out of the warehouse to the despatch department. The fifth column is used simply to enter the balance of stock on hand. This latter column naturally changes every time goods enter or leave the warehouse; thus, the balance on hand is always accurate and up to date. Each of these five columns are duplicated four times on each side of the card for reasons of economy so that each card ultimately provides a record for quite some time. Provision is made at the bottom of the card for the name of the line in the warehouse, and the packing of the line i.e. two, three or four pound boxes is also recorded. The spaces headed "Number" and "Bin" are not used. As more experience is gained with these cards, the latter two spaces will be employed to show the maximum and minimum quantities of the line that should be kept in the warehouse. This will serve as an accurate guide to the Warehouse Superintendent when he draws up his list of requirements.

As goods enter the warehouse, they come in large batches, e.g. one hundred or two hundred boxes at a time,

Consequently it is a simple matter to enter incoming goods immediately onto the stock record cards. The position is, however, slightly more complicated for goods which leave the warehouse, as they are sent out to customers in small lots of three or four boxes at a time. It is obvious therefore, that to enter up every one of these small lots would entail a vast amount of labour and a large number of cards. In order to overcome this difficulty, a rough summary is made every day of all lines sent out of the warehouse. On a large sheet of paper a number of squares are drawn - one square for each particular line made in the factory. As the sweets are sent out of the warehouse e.g. two, four pound boxes of "Nuts and Hard Centres", then under the square for four pound "Nuts and Hard Centres", the figure two is written. At the end of the day the number of boxes of each line sent out of the warehouse is totalled up, and entered into the stock record card under the "Quantity Issued" column. At the end of each day the balance on hand is adjusted in the light of quantities of the line which have entered or left the warehouse on that particular day.

All of these cards are kept in a steel "Kardex" file in the Warehouse Superintendent's office, and are written up by the warehouse clerks under the supervision of the Warehouse Superintendent. Once a week (on Wednesdays), the Warehouse Superintendent goes through all of these cards, noting what stocks are on hand, and what additional stocks are required. He then compiles in duplicate, a complete list of all the different lines he requires. The Warehouse Superintendent keeps the copy of this list of requirements, and the original is handed to the Production Manager who,

before ordering the sweets from the foremen, informally discusses with the Warehouse Superintendent each line that the latter requires. The reason for this is that in some cases the Warehouse Superintendent will not know whether previous orders have been completed or not (because though the Warehouse Superintendent has a copy of his list of his requirements, it is impossible to deliver the exact quantity ordered - it will always be approximately the quantity ordered), thus he will not always know when to re-order sweets or not. In addition the Production Manager makes enquiries regarding other lines which the Warehouse Superintendent has not ordered, if he notices that some considerable time has elapsed since a particular line was last ordered. The list of requirements is then amended in the light of what has been discussed, and the Production Manager then proceeds to write out the orders to the various factory foremen.

The Planning of Production. The quantity of each line ordered by the Production Manager ultimately depends on the optimum batch size that can be produced of the line, and not on the Warehouse Superintendent's list of requirements. This list merely serves as a guide as to how much of what lines are required in the warehouse. Thus, for example, should the Warehouse Superintendent require one hundred, four pound boxes, i.e. four hundred pounds, whereas the economic batch size is two hundred and fifty pounds - the Production Manager would order a double batch i.e. one hundred and twenty-five, four pound boxes. The Warehouse Superintendent is always informed of any

substantial change in his list of requirements, immediately after the Production Manager has written up the orders. This point, however, is of minor importance as in this firm it is immaterial as to what quantity is delivered, provided it approximates to the Warehouse Superintendent's requirements.

Recipe sheets (Form B) are issued by the Chemist and form the basis on which batch sizes are determined. These recipes are based on the most economical batch size, having regard to the capacity of the cooking pans and tables. The confining of order quantities to batch sizes, involves a great deal of co-operation between the Production Manager and the Chemist, and so there are frequent consultations between these parties.

For easy reference all these recipes are summarised in a production blue book which contains the name of the sweets, the recipe number, the batch size of the recipe as well as the department or departments in which the product is made - a typical entry being as follows:-

| Name | Recipe | 1st Dept. | Wt. | 2nd Dept. | Wt. | 3rd Dept. | Wt. |
|-------------|--------|--------------|-----|--------------|-----|--------------|-----|
| Jolly Beans | SA2a | Starch | 119 | Pans | 200 | - | 200 |

Thus the Production Manager would order one hundred and nineteen pounds from the starch department, giving that department instructions to deliver the line to the pans department, and informing the pans department foreman that two hundred pounds of the completed product is required. (In actual practice, all foremen know to which departments their semi-processed goods have to be sent, and it is therefore seldom that they have to be instructed to what other departments they have to deliver).

CONFIDENTIAL

REF :

Recipe Sheet.

DEPT :

LINE :

| MATERIAL | WT. PER BATCH | | | | INSTRUCTIONS. |
|----------|---------------|------|------|------|---------------|
| | 1 | | 2 | | |
| | lbs. | ozs. | lbs. | ozs. | |
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |
| 6. | | | | | |
| 7. | | | | | |
| 8. | | | | | |
| 9. | | | | | |
| 10. | | | | | |

TOTAL MATERIALS :

OUT-TURN :

REMARKS :

DATE :

PASSED BY :

All orders are written out in duplicate by the Production Manager in a special book on Form C, which is divided up into sections and sub-sections - one section for each department. For example, the caramel department section is divided into three sub-sections, viz. "Cut and Wrapped Toffees", "Caramel" and "Hardbake". All of the orders can be divided into two broad groups:-

1. Those sweets which are to form "straight" lines, i.e. are not used for mixtures or chocolate selections and do not require scheduling;
2. Those sweets which are merely one component of a chocolate selection or of a mixture, and therefore, involve scheduling.

1) In the former case the process of ordering is very simple as all that is involved is a simple instruction to the department concerned. For example if the line "Jelly Quins" (batch size - one thousand four hundred and forty pounds) were ordered, under the column headed "Starch-Mogul" the Production Manager would write the number of the order, the name of the line and the weight required, e.g.:

481 Jelly Quins 2,880(i.e. a double batch).

These lines are not scheduled by giving them definite dates, as the production policy of this firm is to allow the foremen of the various departments a certain amount of flexibility. The method of control over these types of orders is dealt with in the section on production control methods. In addition to these lines there is the production of count lines, which are always required, and are therefore given a standing order number and so are produced until such time as the Warehouse Superintendent informs the Production Manager that he has sufficient stocks of the count line concerned.

2) As regards the ordering of mixtures and chocolate selections, the process is very much more complicated because sweets are required from different departments; in some cases, the sweets may go straight to the packing department, in other cases the sweets may have to be processed in several departments first. As a result of this, the scheduling of orders is essential to ensure that all the sweets arrive in the packing department at the same time. The reason for scheduling is to eliminate delays which would result if some components of a mixture or chocolate selection were delivered, while others were not.

It is easier to explain the ordering of these mixtures or chocolate selections by means of an example; the mixture known as "Canasta" assortment has been chosen as it involves work for nearly every department in the factory (See form C). The basic principle underlying the ordering here, is that sweets which require the most processing have to be ordered first. It will be noted that all orders are given an order number for purposes of identification and where sweets are processed in more than one department, the original order number is retained.

In the case of "Canasta" assortment, the sweets which have to be processed in the most departments are the chocolates - thus the chocolate centres from the marzipan, starch, boiling and caramel departments are all ordered for the 3.1.1954. It will be noted that the foremen are not told where to deliver the centres as this is common knowledge - but only the date on which the centres are to be delivered. They also know that the sweets have to be

delivered as early as possible in the morning in order to allow the foreman of the chocolate department ample time to pass the centres through the enrober. If the centres pass through the enrobers on the 3.1.54, they will be ready to be wrapped on the following day. Thus the sweets from boiling department which have to be wrapped (i.e. ordinary boilings, not chocolate coated), are sent to the wrapping department on the 4.1.1954, as well as the sweets from caramel department which also have to be wrapped. Thus the whole mixture (which has to be wrapped in wrapping department), passes through the wrapping department on the fourth of January. This department will then be allowed two days in which to wrap the sweets and as can be seen from Form C, it has to be delivered to the packing department on 6.1.54. Meanwhile the toffees from caramel department (which are completely processed in that department) have also been ordered for the 6.1.1954 and therefore on that date the foreman of the caramel department will send the wrapped toffees down to the packing department. Thus all the components of this assortment will arrive in the packing department on the due date, i.e. 6.1.1954. All the different sweets can then be thrown into one of the mixing bins in the packing department, mixed together and packed in cartons to the required weight.

It will be noticed that, in order to ensure that the packing department receives all the components of the assortment on the same date, the other departments have to deliver their contributions to departments which have to process the goods further, on different dates. The best example in this case is the caramel department which

| No. | Name | Weight | Delivered | No. | Name | Weight | Delivered | No. | Name | Weight | Delivered |
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|

Canasta for 4. 1. 54.

| | | | |
|----|-------------------|-----|--|
| 69 | Mint Humbug | 150 | |
| 70 | Buttermut | 100 | |
| 71 | Cracknel | 100 | |
| 72 | Bon Bon on 3.1.54 | 150 | |

Canasta for 3. 1. 54.

| | | | |
|----|------------------|-----|--|
| 67 | Wafers | 100 | |
| 68 | Marzipan Fingers | 365 | |

Canasta for 3. 1. 54.

| | | | |
|----|---------------|-----|--|
| 64 | Peel Cream | 150 | |
| 65 | Berry Cream | 152 | |
| 66 | M.C.C. Toffee | 212 | |

ENROBER

WRAPPING MACHINES

| No. | Name | Weight | Delivered | No. | Name | Weight | Delivered |
|-----|------|--------|-----------|-----|------|--------|-----------|
|-----|------|--------|-----------|-----|------|--------|-----------|

Canasta on 3. 1. 54.

| | | | |
|----|------------------|-----|--|
| 64 | Peel Cream | 187 | |
| 65 | Berry Cream | 189 | |
| 66 | M.C.C. Toffee | 265 | |
| 67 | Wafers | 464 | |
| 68 | Marzipan Fingers | 125 | |
| 72 | Bon Bon | 187 | |
| 73 | Toffee Centres | 432 | |

All Canasta on 4. 1. 54. - Deliver
to Packing on 6. 1. 54.

| No. | Name | Weight | Delivered | No. | Name | Weight | Delivered | No. | Name | Weight | Delivered |
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|

CHOCOLATE PANS

CHOCOLATE MOULDING

LIQUORICE

| No. | Name | Weight | Delivered | No. | Name | Weight | Delivered | No. | Name | Weight | Delivered |
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|

| | | | | | | | | | | | |
|----|--------------------------|--|--|----|--|--|--|--|--|--|--|
| 76 | Canasta "Clowns" for 4/1 | | | 66 | | | | | | | |
|----|--------------------------|--|--|----|--|--|--|--|--|--|--|

CUT & WRAPPED TOFFEE

CARAMEL

PACKING

| No. | Name | Weight | Delivered | No. | Name | Weight | Delivered | No. | Name | Weight | Delivered |
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|
|-----|------|--------|-----------|-----|------|--------|-----------|-----|------|--------|-----------|

| <u>CANASTA.</u> | | | |
|-----------------|---------------------------|-----|--|
| 73 | Toffee Centres for 3.1.54 | 346 | |
| 74 | Coffee Caramel for 4.1.54 | 178 | |
| 75 | Toffees for 6.1.54 | 700 | |

Canasta on 6.1.54.

HARDBAKE

| No. | Name | Weight | Delivered |
|-----|------|--------|-----------|
|-----|------|--------|-----------|

has to deliver the toffee centres to the chocolate department on 3.1.1954, the caramel to the wrapping department on 4.1.1954 and the wrapped toffees to the packing department on 6.1.1954. This system admittedly makes matters slightly complicated for the factory foremen, but only in that whereas formerly they used to deliver all of their contributions to a mixture on the one date, under the present scheme the deliveries for the assortments are spread over more than one day. Under the old system chaos often resulted because some sweets would arrive in the packing department two or three days after all the other components of the mixture. This caused serious problems of congestion in the packing department as often there were two or three different mixtures waiting to be thrown into the bins, but each one of them lacking one or more of the component lines.

Once all the orders have been written out by the Production Manager, taking into account the full list of the Warehouse Superintendent's requirements, a brief summary sheet (form D), is made out for the chocolate and packing departments. This is not really essential as all information is available on the production orders (form C), but the Production Manager is often asked by the various factory executives when certain sweets will be ready for the warehouse. Form D provides the answer in a ready form as it indicates on which dates various lines will be passed through the enrober and what dates mixtures are to be thrown on the bins in the packing department. This form also provides a type of "loading" schedule for the two departments concerned. For example the packing department cannot throw three mixtures a day on the bins,

MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY | MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY | MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY

E
N
R
O
B
E
R

P
A
C
K
I
N
G

MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY | MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY | MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY

E
N
R
O
B
E
R

P
A
C
K
I
N
G

and to order three mixtures for any one day will lead to congestion in that department. Similarly, though the chocolate department can deal with about five thousand pound weight of chocolate centres per day, there is no object in ordering that maximum quantity as the wrapping department can only handle just over three thousand pounds of chocolates per day. It is only in regard to the chocolate and packing departments that this form is used as all the other departments have considerable flexibility since only about 50% of their work is scheduled - the remainder being "straight lines" not involving scheduling.

Once the orders have been written out, the top copy of form C is torn out of the order book and sent to the factory office from whence the various orders are distributed to the necessary departments. The Production Manager retains the duplicate of the orders in the order book. The Production Manager then informs the Warehouse Superintendent of any significant alterations or additions or deletions from his list of requirements. The original list of requirements, amended by the Production Manager, is then sent to the Factory Supervisor who can then see what products have been ordered for the next ten to fourteen days.

The whole aim of the planning is based on a policy of keeping approximately two weeks' stock on hand in the warehouse, and by planning ahead for a similar period, it is hoped that the sales department of the factory will not run short of any lines that are being sold. Obviously in a factory where so many lines are being manufactured and where demand is so unpredictable, particularly regarding the less popular lines, it is impossible to have all the

lines in stock always but under the new system of planning, this difficulty has been greatly minimised.

Rush orders have been almost eliminated, and if goods are urgently required, they will only be ordered if the production schedule of the various factory foremen concerned will not be interrupted. In most cases the foremen are able to fit in the urgent orders without disrupting their other work within a day or two of the order being placed. Previously the foremen were expected to leave any other work as soon as instructions for a rush order were given to them. Though it is difficult to estimate the exact cost of this type of rush order, it has been estimated (based on discussions with all the foremen concerned), that production was adversely affected by at least 5%.

2. Production Control Methods Employed in the Factory.

The manufacturing returns (form E) are filled in by the various departmental foremen and these forms provide the essential information through which production is controlled. These returns, which are completed by all the foremen at the end of each day and sent to the Production Manager, consists of three separate sections:-

- a) Parts received, which consists of three columns:
 - 1) the first for the order number of the sweets (this was given by the Production Manager on form C);
 - 2) a second column for the name of the semi-processed goods received from other departments;

- 3) the third column for the weight of the semi-processed goods received from the other departments.

The word "parts" is a technical term used in this factory for semi-processed goods. Thus if this return were that of the chocolate department the three entries in this section may well be:-

364 Coffee cream centres 250 lbs.

- b) Raw materials and parts used section, which provides essential information for the costing of the sweet, as will be seen later in this chapter. Here provision is made for what semi-processed and raw materials are used in the fulfilment of a certain order. Once again there are columns for:-

- 1) the order number;
- 2) the recipe or raw materials used (by simply writing down the recipe number of the sweet being manufactured it is unnecessary to write down all the various ingredients used in making up the recipe);
- 3) the weights of raw materials used or the number of batches of the recipe made;
- 4) in cases where the product is made out of semi-processed materials and other raw materials, then the weights of semi-processed materials used and the weights of other materials used are written down.

For example in the pans department where "apricot" centres are received from starch department, the foreman of the pans department would fill in the weight of centres used plus the weight of syrup he uses to pan the apricots. For example:-

| <u>Order</u> <u>No:</u> | <u>Recipe:</u> | <u>Weight:</u> | <u>Parts:</u> | <u>Weight:</u> |
|----------------------------|--|----------------|--------------------|----------------|
| 278 | P4 (The recipe number of the syrup) | 165 | Apricot Centres | 3,560 |

This information would then enable the Production Manager to determine a costing of the line in that he would know that one hundred and sixty-five pounds of syrup P4 were used to cover three thousand five hundred and sixty pounds of apricot centres, which the pans department had received from the starch department.

- c) The third and most important section of the manufacturing return is used both for costing purposes and for the actual control of production in the factory. There are columns for:
- 1) the order number;
 - 2) semi-processed and completed goods delivered to other departments;
 - 3) scrap resulting from the manufacture of the order;
 - 4) the name of the department receiving the goods;
 - 5) the signature of the foreman receiving the completed or semi-processed goods.

The order numbers of these manufacturing returns are obtained from form C, which is given each week to the foremen of the different departments by the Production Manager. As has been stated earlier in this chapter, the Production Manager retains a copy of all the orders, and as the manufacturing returns of the different departments are sent to him (if a return for a certain day, e.g. the twenty-second of any month, the Production Manager receives the return the following day first thing in the morning i.e. the morning of the twenty-third in this example), he crosses through the orders which have been completed on his copy of the orders in the order book. In some cases where the order

has only been partially completed, e.g. three hundred pounds having been delivered whereas six hundred pounds had been ordered, then the weight completed is written down in the order book next to the weight ordered, and the order is only crossed through once the balance, i.e. three hundred pounds, has been delivered. In most cases the weight delivered is never the same as the exact weight ordered and in such cases, the Production Manager has to use subjective judgment. For example in the case of an order for six hundred pounds of a sweet, the Production Manager would query the foreman concerned if, say only four hundred pounds were delivered. Similarly the delivery of five hundred and forty or six hundred and eighty pounds would be queried. Any weight, however, between five hundred and sixty and six hundred and forty pounds would be accepted. Obviously in the case of smaller orders, say for one hundred pounds, a forty pounds variance would have to be investigated by the Production Manager.

It is imperative in the case of mixtures and chocolate selections that the weight of each component line ordered is approximately adhered to in order to ensure consistency. Thus in cases of over delivery of any one line of a mixture, the surplus would be held over till the next time when a correspondingly lesser amount would be ordered, dependent of course on the batch size of the recipe. More simply still, the surplus may be disposed of in one of the special mixtures made by this firm for its larger customers, such as the various bazaars. In the case of a shortfall in the delivery in any one of the component lines of a mixture, there is unfortunately, very little that can be done as a whole mixture of say five to six thousand pounds cannot be held up three or four days while

the shortfall of say one or two hundred pounds is made up. In many cases surpluses from previous orders (when available) are used, or if there is no immediate hurry for the mixture and the shortfall can be made up within a day or two, the throwing of the mixture on the bins in the packing department can be held up. In other cases half the mixture is thrown, while the other half is held back until the component sweet which has been short delivered, can be made up.

In addition to the control of weights delivered, there is also the control of scheduling. This control can be divided into two parts:-

1. Control of goods with scheduled delivery dates.
2. Control over non-scheduled goods.

In the former case there is no problem involved as the Production Manager has merely to look up his copies of the orders in the order book, to see when goods are due for delivery, and ascertain if they have been delivered on that date by referring to the manufacturing return of that day when it is sent to him by the foremen of the departments. In 90% of the cases, the goods are delivered on the scheduled day. In some cases, however, a foreman may find it impossible to deliver on the scheduled day, and in such cases he informs the Production Manager of the circumstances causing the delay and the latter then makes a detailed investigation of what work is being performed by the department in question at that time, in order to determine whether it is possible to re-arrange the department's production programme, with the aim of overcoming the difficulty raised by the foreman of that department. Where it is found impossible to deliver on the scheduled date, then

the department which is to receive the goods is informed - it is usually the packing department which is affected, and the foreman of that department will proceed with other work first. In no cases as yet has this delay been really serious - at the most a delay of a day is involved, and usually once the foremen find they are unable to deliver on the scheduled day, the Production Manager by a re-arrangement of the departmental production programme is able to overcome the difficulty.

In the case of non-scheduled goods, the Production Manager has to use a great measure of subjective judgment based on what other work the factory has on hand, the urgency of the sales department's demand for the non-scheduled goods, and the type of work involved in the manufacture of these goods, for while some of the lines made by this firm can be completely processed within a day, others take from four to six days to complete. In normal periods of business activity, however, (i.e. most of the year with the exception of the latter three months of the year which is an extremely busy period for the sweet industry) a fortnight is allowed between the placing of the orders with factory foremen and the delivery date of the goods ordered. Where the line is required urgently by the Warehouse Superintendent, the foremen concerned are informed of the urgency and the manufacture of these lines is given preference over other non-scheduled lines but not over the production of lines with scheduled delivery dates. Because this system of production control is flexible, this method has been found to work extremely well and it is submitted that no improvement is necessary. The system of scheduling cannot be extended to include all the lines manufactured in the factory as it would over-centralise the production planning in the hands of the Production Manager, and eliminate any

possibility of foremen of the departments having any control in the operation of their departments. It is essential that foremen be allowed a certain amount of control so that they can deal with problems caused by: e.g., the break-down of machinery and absenteeism. If these problems were continually referred to the Production Manager, it would result in the production control system being over-centralised. Furthermore, it is part of the production policy of this firm to give the foremen of the departments at least a fair measure of control in the running of their departments. In addition to the principal methods of production control as described above, there are several additional methods of control at present employed in the factory. The most important of these are:-

- a) In regard to all count lines which are given standing order numbers, e.g. JB for the four-penny line Joy Bars, foremen must make as much as possible of these lines because there is a very great public demand for them. The production of these lines, however, must not be allowed to interfere with the production of lines ordered by the Production Manager - these lines with standing orders may be regarded as "filling-in" lines. Records are kept of the daily production of all the lines which are standing orders so that the quantity produced at any time can be determined. Should the Warehouse Superintendent have a sufficient quantity of these lines in stock, he would inform the Production Manager who would then stop the production of these lines for a certain period. When these lines are again required by the Warehouse Superintendent, the Production Manager re-issues the standing order number of the line to be produced.
- b) Where so many count lines are produced, it is essential that the weight of these lines be rigidly controlled. For example, great loss would be suffered by the firm if a line is sold at nine shillings per gross of ten pounds weight, and the weight of the line were allowed to deviate to twelve or even thirteen pounds to the gross. On the other hand, if the weight were less than ten pounds per gross, it would mean that the

sweets would be smaller in size and customers would complain. In the case of the weight exceeding ten pounds per gross, it would mean that the firm is "giving" away extra weight and receiving no extra price because the line is sold in gross lots, and not by weight.

To overcome this very serious problem a full time checker has been appointed to weigh off samples of count lines from every batch produced in the factory. The correct weight of all count lines is supplied by the Production Manager to the Checker, and the results of the test weighings by the Checker are recorded, and all deviations from the norm are investigated. Once again the Production Manager has to use subjective judgment as it has often been found that weights may vary by approximately a quarter of a pound per gross from the norm. It is the average, however, with which the Production Manager is primarily concerned, and it is only when marked deviations occur (e.g. weights deviating by half a pound per gross or more) that an investigation is made. In the case of count lines not weighing what they should, the Checker's weights are first checked, and once the Production Manager has confirmed the deviation in weight, the matter is taken up with the foreman concerned. The very fact that a check is being made of the weight of all count lines, serves as a very strong incentive to factory foremen to maintain the standard weight, and consequently, it is only in isolated instances that the weights of these lines vary to any marked degree.

- c) It is also essential that a record be kept of the monthly weight loss of materials in all departments in the factory, so that, when an exceptional weight loss occurs, the matter can be investigated. All foremen requiring raw materials from the raw materials store, make out a stores requisition slip, stating the quantity of the materials they require. One copy is sent to the raw materials store whilst the duplicate copy is retained by the foremen for reference in the event of any enquiries arising. These store requisition slips plus the first section of the manufacturing return, (form E), i.e. the parts received section, when totalled together give the weight of raw materials and semi-processed goods which the department has received on that day. Similarly the parts and scrap delivered section of the manufacturing return provides information as to what deliveries have been

made by the department on any particular day. These weights are entered daily into a production record book and at the end of the month, the difference between the input to the department and the output from the department (taking into account the departmental stocks of raw materials and semi-processed goods at the beginning and end of each month), provides the monthly weight gain or loss of the department. Over many years it has been determined what the expected weight gain or loss of different departments should be, and when marked deviations from the expected weight gain or loss of the department concerned occur, it is essential that the discrepancy be investigated. It is usually found that either foremen have not entered everything onto the manufacturing returns or that weights have been incorrectly totalled.

The total factory weight loss is derived by subtracting all receipts of goods received by the warehouse from all issues by the raw materials store for that month to the factory (taking into account the total stock in hand of all the departments at the beginning and end of each month). This total factory weight loss figure should then agree exactly with the sum of all the individual departmental weight gains or losses for the month. In practice, however, this very rarely occurs owing to the impossibility of taking an accurate stocktaking of all goods, in every department of the factory, every month. For purposes of control, however, the system is sufficiently accurate.

Though this question as regards factory weight loss is only one aspect of production control, it is nevertheless an important aspect as it enables the system of production control to be extended to cover departmental monthly weight gains and losses. For example an unusual percentage departmental gain or loss in weight initiates an investigation into the reasons for such an unusual gain or loss; and as a result of this investigation, many errors (such as the incorrect entry of goods in the manufacturing return), which normally would not have been discovered, are brought to the notice of the Production Manager.

- d) In order to ensure that weights entered on the output side of the manufacturing return are correct, all goods are weighed by the foremen of the receiving departments, so as to eliminate

the possibility of the foreman delivering the goods, entering a false weight on his daily manufacturing return. This does not, however, mean that the foreman delivering the goods has to accept the weights, as he knows that the weight delivered by him, should approximate to the number of batches made by him. In cases of dispute, the Production Manager is called upon to judge the matter, to check up on the weights, and to determine which party is in the right.

- e) In addition to the control measures described above, there is the important question of quality control which is the responsibility of the Factory Superintendent and Chemist. The latter makes routine tests to ensure standardisation of texture, flavouring and colouring, while the former exercises generally supervisory powers.

- f) A final point on control methods employed in the factory is the important question of the control of the labour force employed. Prior to 1954, the labour force of this firm fluctuated to a very marked extent, primarily owing to the extremely inaccurate records being kept of the different departmental labour forces, resulting in the factory management employing rather too many than too few workers. Under the present system of production control, however, accurate records are kept of the total labour force employed in the factory, as well as of the labour force of each individual department. The maximum labour force necessary for each department has been determined, and any foreman requiring additional labour over and above the maximum, has to supply the Production Manager and Factory Superintendent with very good reasons before his request is agreed to. Although the introduction of the wage incentive scheme makes it impossible to determine the exact extent to which this labour control has contributed to the reduction of the labour force of this firm, it is believed that it must have had some considerable effect.

The production control methods described in this chapter have contributed very largely to the smooth running of the factory and because of this, these control measures are rigidly applied. It is submitted that the probable reason why these methods have been so successful is, that

prior to 1954, practically no production control measures were applied, and this firm therefore provided an empty, but fertile, field in which to practice the full scope of scientific control methods.

3. Production Planning and Control Problems in the Factory.

Since the introduction of the system of scientific management in 1954, most of the more serious production problems have been eliminated. This is particularly so in regard to production planning and control, but several minor problems still exist, the most important of which are listed below:-

- 1) The introduction of standardised recipes, though having an overall good effect, has given rise to certain problems. The most important of these occurs when a chocolate selection or mixture requires a certain fixed proportion of the different component sweets in order to ensure that the sweets "pack-out" correctly, i.e. all the sweets that have been ordered are used. For example one hundred and twenty pounds of any one particular sweet may be required, but the batch size of the sweet may only be seventy pounds. Thus the Production Manager is obliged to order two batches, i.e. one hundred and forty pounds. The extra twenty pounds will then be left after all the other sweets have been packed. This problem, however, is to a large extent overcome in that the excess sweets are often used for the making up of special mixtures for retail organisations such as bazaars, or by packing more than the normal number of sweets per box. The latter practice, however, is not approved of, as it leads to variation in the standard of packing.
- 2) A further planning problem, inherent in the sweet industry itself, is that the demand for confectionery products is extremely seasonal and also extremely irregular during the different seasons. Thus what may be a sufficient stock for one month, is often insufficient for another month. The problem of fluctuating consumers demand for this firm's products, is the prime cause of goods

being out of stock. It should, however, be possible to overcome this problem once sufficient information from the stock record cards is obtained. These cards have been kept for only one year and it is inevitable that quite a number of years will have to elapse before reliable information to guide the planning of production, can be obtained from them.

- 3) A third planning problem is caused by a number of factory executives, e.g. the Sales Director giving instructions to foremen to manufacture certain lines, without first informing the Production Manager. This is still the remnant of the order of things prior to 1954. This problem is being overcome as foremen have been instructed by the Production Manager to inform him of all such orders, and the latter then takes the matter up in a tactful manner with the factory executive concerned, and fits the special order into the normal factory production programme. All factory executives are, however, attempting to follow the correct channels of production procedure, and such instances as described above are becoming very rare occurrences.

- 4) Up to the present there has been no fixed policy as regards the introduction of new lines. Often the Factory Superintendent would develop a new line, exhibit it to the Sales Director who would, if he approved of the line, send samples to all sales representatives of the firm, with instructions to commence selling the new product. If the line is a good one (and also because it is a new one), sales might be exceptionally good. If this was the case, production would usually be inadequate. This unsatisfactory state of affairs would result in the line being out of stock, customers would receive their orders without the new line which they had ordered, and so they would complain about the service given to them by this firm. During the latter part of 1954, a system was instituted whereby the Production Manager took an active interest in the introduction of new lines, and only when stocks had been accumulated in the warehouse, would samples of the new line be sent to the sales representatives of the firm with instructions to commence selling it. This system has proved successful so far, and by adhering to this policy, it is believed that this problem will have been permanently overcome.

- 5) It is extremely important that standardisation be maintained and as a result of this, only the best raw materials are purchased. Often, however, where raw materials, e.g. stem ginger, are in short supply, this firm has to take whatever quality it can obtain. No amount of processing can alter the basic characteristics of a poor raw material and so where poorer quality raw materials are used, standardisation becomes impossible. In addition, it has happened that raw materials received, e.g. from Hong Kong, have not been up to the standard of samples received. In such cases, there is little the firm could do except to take the matter to Court. Owing to the trouble and expense involved, however, this is never resorted to but the firm does sometimes receive a nominal rebate from the suppliers. Thus, even in the event of there being no financial loss, the firm is still saddled with inferior raw materials and in such cases, produces goods below the required standard.

- 6) A constant problem is the case of large customers of the firm who require special sweets to be produced for them, or standard lines produced by the firm to be especially wrapped and packed for them. Theoretically the firm should refuse to accept any such special orders (particularly in the event of their being only small quantities), as such special orders have a disrupting effect on the smooth flow of production. By refusing such orders, however, the firm is liable to lose goodwill and hence business, particularly as most of the special orders are for very large customers, and so it is more or less forced to accept such orders. High prices cannot be charged for these special orders as the customer is liable to complain, hence many of these orders result in the firm suffering a financial loss. The only remedy open to the firm is to instruct all their sales representatives to discourage such orders. At its best, however, this is an ineffectual remedy.

- 7) In the factory a large variety of containers are used in the transportation of semi-processed and completed sweets from one department to another, and even the individual containers of any one type may vary in weight by anything up to four or five pounds. In order to overcome this difficulty, the different containers of any one type are given average weights, and when a foreman receiving goods from another department weighs the sweets, he deducts the average weight of the number of containers involved,

thus giving the nett weight of the sweets received. To illustrate:-

| | |
|--|------------------|
| Total weight of sweets and six containers ----- | 240 pounds |
| Six containers (average weight being seven pounds) ----- | <u>42</u> pounds |
| Nett weight of sweets received <u>198</u> pounds. | |

As these containers are continually being repaired, the problem is greatly increased since each repair alters the weight of the container still further from the average. As a result of this the nett delivered weights cannot be regarded as being perfectly accurate. This is an extremely important problem and could quite easily be overcome by the introduction of standardised containers. The vast capital expenditure that would be necessary, however, has made the Directors of the firm reluctant to introduce such new standardised containers, except in cases where the old containers are irrevocably damaged. Thus it is only gradually that standardised containers are being brought into use, and until such time as the new containers have completely supplanted the old ones, the weighing of sweets in the factory will be subject to the same errors.

- 8) Stock is taken throughout the factory, once a month, the main reason for this from the production point of view being that these stock figures are necessary for both compilation of both departmental and total factory weight gain or loss. This stocktaking has to take place either after work on one of the weekdays or on a Saturday morning. Taking into account the weight of stock concerned (about three hundred thousand pounds weight on the average per month), very little time is spent on the stocktaking - usually about an hour to two hours. Naturally as a result of this, it is evident that there must be a considerable percentage of error in the monthly stock figures. The hasty manner in which the stock is taken can well be imagined when it is realised that workers normally have to work overtime whilst taking stock. As a consequence of this method of stocktaking, the monthly departmental and total factory weight gain or loss figures are not nearly as accurate as could be desired. On many occasions when a department has shown an impossible weight loss figure for any particular month, the reason (by a process of elimination of all other possibilities) has been found to be inaccurate stock figures. Despite

the errors involved, however, the system of determining departmental gains or losses is far too useful a control method to forgo; the only possible solution is to have the stocktaking in each department carried out under the supervision of senior factory executives, instead of as at present under the supervision of the different factory foremen.

In addition to the above problems, many other minor problems still exist such as the calling of one particular line by two or more different names, thus leading to a great deal of confusion, inaccuracies in weighing finished and semi-processed goods, and the lack of care by workers generally in their work. All of these, however, are routine production problems from which any large firm has to suffer. These minor problems have been recognised by the factory executives, and where measures have not already been taken to remedy them, plans are in hand to minimise their promiscuity and effect.

4. The Introduction of the Costing System.

When a scientific cost accounting system was introduced, it was a greatly overdue necessity. All previous attempts at costing, with the exception of the system introduced by the Chemist (see chapter four), were extremely inaccurate, being largely in the form of approximations as to what the cost of any line was. Even when the cost of the line was so "established", this cost was altered, if necessary, to fall into line with competitors' prices. Even the system of the Chemist was beset with difficulties, as described in chapter four, and mainly owing to the time factor involved in working out the cost of any line, this method was of very little practical importance. Thus up to 1954, the main method of determining

the selling price of the company's products continued to be by reference to competitors' prices supported by the approximations made by the Sales Director as to the actual factory cost of the line. That this method was inaccurate, was borne out by the number of lines which were later shown to have a cost price in excess of their selling price, after the costing system as introduced by the efficiency expert had been established for some time.

The main work in formulating the costing system was in regard to the drawing up of a list of overhead expenses, and allocating those expenses to the different departments in a rational and logical way, in order to calculate the labour and overhead rate per pound weight of sweets produced. The determination of the actual cost of ingredients used was a relatively simple matter because standardised recipes had been introduced by the Chemist and so in addition to the batch sizes of the recipes being the same, the weights of the different ingredients used in the recipes, were also fixed. In giving a description of the costing system now in operation, details will first be given regarding:-

- 1) the calculation of the labour and overhead rate (obtained after the labour rate and overhead rate have each been calculated);
- 2) how the materials cost is obtained;
- 3) the actual costing procedure.

1) The Calculation of the Labour and Overhead Rate.

The first step was to draw up basic data for use in apportioning overhead expenses. This basic data was of two

form, the basic data is applicable not only to departments, but also in some cases to sub-departments, e.g. the pans department is split into two sections viz., pans and liquorice. The division of this information where possible, into data applicable to sub-departments is extremely important because it enables a different labour and overhead rate to be computed for the different types of work in the same department. In the case of the pans department for example, it is unrealistic to apply one labour and overhead rate to the whole department as two very distinct types of work are carried on. Whilst the general labour and overhead rate for the department as a whole would be accurate, it would be unfair, in that one sub-department might be too heavily charged and another too lightly.

When form F has been completed, the overhead distribution sheet (form G) can be drawn up. This sheet indicates:

- 1) the overhead expenses which are to be distributed ;
- 2) the basis upon which the distribution is to be made;
- 3) the total per year and per week of each item of overhead expense. It should be noted that it is the weekly overhead expenses which are distributed among the departments;
- 4) the individual servicing and producing departments which have to bear the overhead charges.

The first overhead charges which are distributed are those which can be directly charged to the departments concerned. These direct departmental charges are shown on form G, from which it will be observed that the wages and salaries of only the service departments are allocated at this stage. What happens to the direct labour charges of the producing departments will be explained later.

Once the total direct departmental overheads have been apportioned, the next step is to allocate the indirect overhead expenses to each department and sub-department, service and producing. The total cost per annum of each one of these expenses is obtained from the accounting records kept by the Secretary-Accountant of the firm. Unfortunately, no budgetary control system is as yet in operation in the factory, and so this method of apportioning overheads has the very definite disadvantage of being a "dated" or historic apportionment. It has been kept in mind, however, in the drawing up of the overhead distribution sheet that certain overhead expenses are bound to differ from year to year. Thus the amounts of previous years are moderated in the light of the current year's expected charges or activities. This means that a certain amount of budgeting is incorporated into the costing system. As this system is still in its infancy it has not yet been possible to determine exactly how accurate these estimates are, but it is highly probable that after some years the estimates will become more and more accurate in the light of the experience that will have been gained.

The apportionment of these indirect overhead expenses is made on the basis indicated on form F, for example:-

- 1) interest on the building loan is apportioned on the logical basis of the percentage floor space of each department as compared with the total floor space of the building;
- 2) the cost of overalls is apportioned according to the number of employees in each department or sub-department;
- 3) the cost of water used, is based on the estimate of the percentage water used by the different departments.

Once these indirect overhead expenses have been

apportioned, the total overhead expenses for service and producing departments are obtained by adding direct and indirect overhead expenses together giving a total weekly overhead figure for both the service and producing departments.

As the service departments do not in themselves produce any goods for sale, the overhead expenses of the different service departments have to be distributed on a sound basis over the different producing departments. Thus, for example, the costs of the canteen are apportioned, very logically, on the estimated usage of the canteen by the different producing departments, i.e. on the number of employees in each of the producing departments. On similarly logical bases, the costs of the other service departments such as the yard, maintenance department, boilerhouse, warehouse, laboratory, stores and printing works are distributed over the producing departments until ultimately the total overhead expense of the factory per week has been apportioned to each one of the producing departments or sub-departments. The final step consists of converting the total weekly overhead costs of each of the producing departments to a rate per pound of output and then combining this rate with the direct wages of the workers per pound of output produced in the departments, to give the combined labour and overhead rate for each producing department.

The manner in which the overhead expenses of the service departments are apportioned, is of considerable interest because initially, the expenses of one service department have to be apportioned to other service departments as well as to the producing departments. For example, the costs of running the factory canteen are apportioned among all the other service departments as well as all the producing departments. It is obvious, however, that the canteen itself is served by other

service departments such as the yard and maintenance departments. Therefore in all fairness, portion of the costs of the latter two departments should also be charged to the canteen. This problem, however, would lead to such complications that it has not been thought worthwhile to go into the matter for the small additional amount of accuracy that would be obtained, as ultimately all the service departments' costs are apportioned to the producing departments in any case. The best that could be done was to arrange the service departments in succession so that the departments which received least from the other service departments, had their total weekly costs apportioned first.

Form H is used for reducing the overhead costs of the producing departments to a rate per pound weight of sweets produced, and further adding that rate to the labour rate per pound weight of production to give the combined labour and overhead rate for the different departments. The main problem in this connection is selecting a reasonable output for each department as the production in the different departments varies so much during the course of the year. In the producing departments to which the incentive wage scheme applies, the standard weekly production is used (taking the total labour force into account), whilst the average weekly production figure of the departments is used in all other cases except in the pans department. In the latter department the output fluctuates violently from week to week (partially because of its heavy dependence on the other producing departments for work), and so the average weekly amount of stores used is taken. In this case, the labour and overhead rate does not apply to the total weight of the goods sent out of the department but only to the weight which pans department adds to the semi-processed goods which it receives

JANUARY, 1955.

DEPARTMENT PRODUCTION COSTS PER LB. WEIGHT AND PER DIRECT LABOUR HOUR.

Form H.

| | | a | b | c = a + b | d | e | f = c ÷ e | g = d ÷ e | h = f ÷ g | PRODUCTION COST PER DIR. LABOUR HOUR | | |
|-------------------|----------------|---------------------------|-------------------|-----------------|-----------------------|---------------------|-----------------------|-------------------------|-----------------------|--------------------------------------|--|---|
| Based on | Dept. Wages | Allocated Foremen's Wages | Total Dept. Wages | Dept. Over-head | Dept. Standard Output | Average Labour Cost | Average Overhead Cost | Average Production Cost | No. of DIRECT workers | No. of LABOUR Hrs. per WEEK | Labour & O/H Cost per Direct Labour Hour (Wages & O/H) Hours | |
| | £ | £ | £ | £ | LBS | D/LB. | D/LB. | D/LB. | (Approx) | | | |
| Milk Condensing | Ave. Prod. | 7 | - | 7 | 32 | 1,000 | 1.68 | 7.7 | 9.4 | - | | |
| Box Manufacture | Ave. Prod. | 166 | In a. | 166 | 114 | - | - | - | - | 16 | x44 = 700 | $\frac{£166 + £14}{700} = \frac{8}{-}$ per hr. |
| Chocolate Mill | Ave. Prod. | 36 | 1 | 37 | 127 | 10,000-20,000 | .89d-.45d | 3.05-1.9 | 3.9-1.9 | 7 | 308 | |
| Chocolate Pans | Ave. Prod. | 12 | 1 | 13 | 29 | 6,000 | 0.52d | 1.16 | 1.7 | 3 | 132 | |
| Chocolate Mould | Standard Prod. | 90 | 2 | 92 | 58 | 7,000 | 3.15 | 2.0 | 5.2 | 17 | 750 | $\frac{£92 + £58}{750} = \frac{4}{-}$ per hr. |
| Chocolate Piping | Standard Prod. | 16 | 1 | 17 | 4 | 700 | 5.8 | 1.37 | 7.2 | 2 | 88 | |
| Chocolate Enrober | Ave. Prod. | 80 | 9 | 89 | 93 | 21,000 | 1.02 | 1.06 | 2.1 | 13 | 570 | |
| Cocktails | Standard Prod. | 42 | 1 | 43 | 13 | 1,000 | 10.3 | 3.1 | 13.4 | 6 | 264 | $\frac{£42 + £13}{264} = \frac{4}{3}$ per hr. |
| Starch | Standard Prod. | 240 | 21 | 261 | 285 | 33,000 | 1.9 | 2.1 | 4 | 45 | 1980 | |
| Marzipan | Standard Prod. | 120 | 16 | 136 | 136 | 21,000 | 1.55 | 1.55 | 3.1 | 25 | 1100 | |
| Boiling | Standard Prod. | 110 | 16 | 126 | 201 | 25,000 | 1.21 | 1.93 | 3.1 | 24 | 1060 | |
| Caramel | Standard Prod. | 185 | 16 | 201 | 332 | 54,000 | 0.89 | 1.48 | 2.3 | 40 | 1760 | |
| Hardbake | Standard Prod. | 18 | 2 | 20 | 36 | 7,000 | 0.68 | 1.23 | 1.9 | 4 | 176 | |
| Pans | Stores Used | 40 | 13 | 53 | 86 | 12,000 | 1.06 | 1.72 | 2.8 | 9 | 396 | |
| Liquorice | Ave. Prod. | 20 | 4 | 24 | 40 | 3,000-6,000 | 1.92-0.96 | 3.2-1.6 | 5.1-2.6 | 4 | 176 | |
| Wrapping M/C. | Standard Prod. | 145 | 19 | 164 | 120 | 35,000 | 1.12 | 0.83 | 2d | 32 | 1400 | |
| Packing | Ave. Prod. | 240 | 10 | 250 | 76 | - | - | - | - | 55 | 2420 | $\frac{£250 + £76}{2420} = \frac{2}{9}$ per hr. |

based on the previous year's figures, these figures are used only as a guide, bearing in mind that the position may well be changed in the current year. Thus, the figures of previous years are altered in the light of any actual or possible changes which may have been or may be made in the current year; e.g. advertising expenses are based not so much on what has been spent in the past, but rather on what amount is likely to be spent in the current year.

After the total of the administrative and selling overhead expenses has been determined, the yearly cost of all raw materials (including all packing materials), wages and salaries (of the production staff of the factory) and the yearly overhead costs (obtained from the overhead distribution sheet), are totalled, giving a yearly total of all expenses to the firm with the exception of administrative and selling overhead expenses. The latter costs are then worked out as a percentage of all other costs.

E.g.

| | |
|---|-----------------|
| Assume total cost of raw materials as | £50,000 |
| " " " " overhead expenses as.... | 20,000 |
| " " " " wages and salaries..... | 30,000 |
| (of production staff) | _____ |
| | <u>£100,000</u> |

Assume total of administrative and selling overhead expenses to be £15,000 - then these expenses represent 15% of all the other costs listed above. Consequently in the actual costing of the different lines made by the firm, the 15% for the administrative and selling expenses would be added on once all the other costs such as raw materials, departmental labour and overhead costs, have been worked out.

Thus a result of the above system of determining the

overhead expenses of the firm, the following information is readily available.

1. The departmental labour costs per pound weight of sweets produced;
2. the departmental overhead costs per pound weight of sweets produced;
3. the combined departmental labour and overhead rate;
4. the production cost per direct labour hour; and
5. the administrative and selling expenses expressed as a percentage of all other costs.

2) The Calculation of the cost of the Raw Materials.

The recipe sheets (form B) drawn up by the Chemist provide the basic data for the calculation of the raw materials cost of the sweets produced in the factory. It is quite certain that but for the work of the Chemist, the costing system as it is today could never have been introduced into the factory, because originally no-one could state with any degree of certainty just what quantity of which ingredients went into the manufacture of the sweets. Since the introduction of these recipe sheets, foremen must adhere to the approved recipe, which facilitates the costing of the raw materials. A copy of all the recipes (which are all given reference numbers), is kept by the Production Manager who is also informed of all recipe changes.

The information obtained from each recipe sheet is then transferred to the raw materials cost card - form I. These cards, which are all filed according to the recipe reference number, are divided into four sections - one for the materials

used and the other three sections for costing information. The date on which the card is first filled in, is written in the space for that purpose in section A of the card. Under the column headed "materials" all the ingredients, e.g. sugar, glucose and flavouring, used in making the sweets are written. Next to the materials used is a column for the weight of each of the ingredients used - this is also obtained from the recipe sheets. There is also a column for the unit price of each ingredient and finally provision is made for the total cost of each ingredient in the recipe. The cost column is then totalled giving the total materials cost for the recipe. Sections B and C of the form are only used when the weight or the unit price of any ingredient in the recipe changes, and so avoids the necessity of writing out a new card. When the materials in the recipe, are altered, however, a new card has to be made out. It will be noted that the card has provision for the description of the recipe, e.g. "London Toffees", and for the reference number of the recipe, e.g. "B24a".

Once the total ingredient cost has been derived at, this figure is divided by the total weight of the ingredients used to give the unit price, i.e. the cost per pound of the total recipe. This raw material cost is used in all costings of goods made in the factory. There are, however, occasions when this information is not sufficient. For example, it often happens that a costing is required of a certain line which is not being manufactured at the time. In such cases the raw materials cost as derived in the manner described above cannot be used as this figure does not take into account any cooking gains or losses. Obviously in cases where costings are made of lines actually being manufactured in the

factory at the time, the cooking gains or losses are obtained from actual figures returned by the factory foremen to the Production Manager on their daily manufacturing returns. Thus in cases where a so called "theoretical" costing is required, i.e. a costing of goods not being manufactured at the time of the costing, the Chemist calculates the expected yield of each recipe, and this figure then divided into the raw materials cost gives the ingredient cost per unit in such cases. For example if the total cost of the recipe were ten pounds, and the weight of raw materials used is two hundred pounds - then the total ingredient cost per pound is equal to one shilling. In the cases of theoretical costings, however, the Chemist might calculate the yield to be only one hundred and eighty pounds (i.e. he expects a cooking loss of about twenty pounds) and in such cases the raw materials cost per pound would be equal to ten pounds sterling divided by one hundred and eighty pounds weight, i.e. a unit price of thirteen point three pence per pound. The former figure of one shilling per pound would then be used in the costing of batches actually passing through the factory at the time, while the latter figure of thirteen point three pence would be used in theoretical costings, in order to account for what the cooking loss would be in all probability.

Once form I has been completed, information is then available as to the raw materials cost of each recipe, as well as the labour and overhead rate of each department obtained from form H. With this basic data the total cost of any line made in the factory can be determined.

3) The Costing of Lines Produced in the Factory.

The costing of the lines made in the factory can be divided into two groups:-

1. those lines which are independent of all other lines, i.e. just one individual variety of sweets, e.g. the line called "Jelly Babies"; and
2. those lines which are made up of two or more different component sweets, i.e. mixtures and chocolate assortments which may have as much as ten different component lines.

A. Single lines. Form E - the daily manufacturing return from each department provides the basic information for the costing of the different lines produced in the factory. Under the raw materials and parts used column, is information as regards the order number of the line, the recipe which is used, the weight of the recipe, (normally instead of writing down the weights of the recipe, the foremen write down the number of batches of the recipe that they make) and the quantity of semi-processed materials used. Similarly the "parts" and "scrap" produced section of the return gives all information regarding what, and how much has been produced and the amount of scrap. When a foreman makes any particular line, he merely writes down the order number of the line and the recipe and number of batches of the recipe that he uses. Therefore, when the lines are being costed, it is necessary to look under the relevant order number in the Production Manager's order book to see what line is being referred to by the foreman. When the line is delivered, however, the name is written out and not the recipe number so that foreman receiving the goods knows what line he is receiving. To illustrate the costing method employed in this firm, it is best to give a typical

example, therefore let it be assumed that the line "Chocolate Nougat" is to be costed.

The costing itself is worked out on the costing sheet - form J. Space is left in the top right-hand corner of the form for a description of the line i.e. Chocolate Nougat, and the order number - say 464. Basic data such as the date on which the line is made, the department in which it is made and the weight of the recipe, are first filled in. The cost per pound weight of the recipe (let it be assumed to be sixpence in this case), the size of the batch and the total cost of the batch are all obtained from form I. The weight of the nougat which is delivered as well as the resulting scrap is found on the daily manufacturing return. In this case, let it be assumed that the nougat is delivered on the same day as it is made. It will be noticed that one hundred and eighty pounds of nougat out of the total batch of two hundred pounds is delivered to the chocolate department which leaves a shortage of twenty pounds in weight. Nine pounds of this twenty, let it be assumed is scrap, and it can be safely assumed that the remaining eleven pounds is a cooking loss. This loss of eleven pounds is written down in the weight gain or loss column and compared with the expected weight gain or loss. In this case, it can be seen that a weight loss of about 9 lbs was expected and therefore the weight loss of eleven pounds does not cause any undue concern.

The next step is to add the labour and overhead rate of four pence per pound obtained from form H. To get the total labour and overhead cost for the batch in the marzipan department, the labour and overhead rate, i.e. four pence, has to be multiplied by one hundred and eighty nine pounds, i.e. the weight delivered plus the scrap. The scrap will in all pro-

bability be used in the same department for the manufacture of another line, and therefore order four hundred and sixty four has to be credited with the raw materials value of the scrap, viz. sixpence - the same as the unit price of the recipe MN4. It should be noted that no allowance is made for the labour and overhead rate charged on the scrap, because this is a definite expense incurred in the manufacture of the order (and hence the scrap), and has to be borne by this order. To obtain the net cost of the batch, the value of scrap credit is deducted from the total of the labour and overhead cost and the total value of the materials used in the making up of the order. To illustrate from the example:-

| | |
|------------------------------------|-------------------|
| Labour and overhead expenses | £3. 3. 0. |
| Materials | <u>5. 0. 0.</u> |
| | £8. 3. 0. |
| Less value of scrap | <u>5. 6.</u> |
| | <u>£7. 17. 6.</u> |

This figure of £7. 17. 6. is then divided by the weight of nougat sent out to the chocolate department (180 pounds), giving a price of 10.5 pence per pound. This latter figure represents the cost per pound of the batch of the nougat at the stage when it has been sent by the marzipan department to the chocolate department.

The nougat is received by the chocolate department on the same day, and let it be assumed, the nougat centres are immediately covered with chocolate on one of the two enrobers. The weight of the nougat before being covered with chocolate couverture is subtracted from the greater weight after the nougat has been covered, and the difference represents the

weight of chocolate used, The cost per pound weight of the chocolate covered nougat on leaving the chocolate department is found in exactly the same way as the cost of the nougat was on leaving the marzipan department. The only differences involved here are that the chocolates are only delivered to the wrapping department the day after the nougat has been chocolate covered, and, that the chocolate used in covering the nougat is expressed as a percentage weight gain over the uncovered centre, viz. $\frac{60}{240} \times 100$ which equals 25%. This percentage represents a perfectly normal chocolate couverture.

The whole process described above is repeated to calculate the cost per pound after wrapping except, that the foil used in the wrapping is not charged for at so much per pound of foil used but rather at so much per pound weight of the sweets which have to be wrapped. The reason for this is that it is usually impossible to get the weight of the foil used unless the sweets are accurately weighed before and after wrapping. No two scales in the factory are exactly in alignment, therefore a difference of one or two pounds weight in the different scales is always a possibility that must be borne in mind. This is extremely important as can be seen in the example on form J where the foil used weighs only four pounds (two hundred and forty four pounds less two hundred and forty pounds) and therefore a difference of two pounds in alignment of the scales of the chocolate department and of the wrapping department scales, can affect the costing of the line very markedly.

Once the final cost of 22.2d per pound weight of sweets produced is obtained, there only remains to be added the costs of packing the line, the packing materials used and the administrative and selling overheads. The costs of the packing materials

Analysis of Weight (Gain Loss) and Production Cost.

Order No. 464

| Date | Dept. | Material Used. | | | | | Material Produced. | | | Weight Gain or Loss | | Production Cost | | | | | | | | | | Comments. | | | | |
|---------|-----------|---------------------------|--------|--------------|-------|----|--------------------|----------------------|--------|---------------------|-----------------------|-------------------------|-----------------------|---------------------|----|---|---------------------|-----------------------|---|----|-------------------|-----------|------|--------------|----------------------------------|---|
| | | Recipe No. or Description | Weight | Cost per lb. | VALUE | | | PARTS Description | Weight | SCRAP Weight | Actual +/- or -- lbs. | Expected +/- or -- lbs. | Labour and O. H. Rate | Labour & O. H. Cost | | | Scrap Value per lb. | Value of Scrap Credit | | | Net Cost of Batch | | | Cost per lb. | Dept. receiving Processed Order. | |
| | | | | | £ | S | D | | | | | | | £ | S | D | | £ | S | D | £ | | S | | | D |
| 8.2.54 | MARZIPAN | 2 Batches MM 4 | 200 | 6d | 5 | - | - | Nougat Centres | 180 | 9 | - 11 | 9 | 4d | 3 | 3 | - | 6d | 5 | 6 | 7 | 17 | 6 | 10.5 | Chocolate | | |
| 8.2.54 | CHOCOLATE | Nougat Centres | 180 | 10.5 | 7 | 17 | 6 | | | | | | | | | | | | | | | | | | | |
| | | Chocolate | 60 | 2/9 | 8 | 5 | - | | | | | | | | | | | | | | | | | | | |
| | | | 240 | 16d | 16 | 2 | 6 | | | | | | | | | | | | | | | | | | | |
| 9.2.54. | | | | | | | | Chocolate Nougat | 240 | | 25% | | 2d | 2 | - | - | - | - | - | 18 | 2 | 6 | 18.1 | Wrapping | | |
| 9.2.54. | WRAPPING | Chocolate Nougat | 240 | 18.1 | 18 | 2 | 6 | Wrapped Chocolate | 244 | | | | 2d | 2 | 15 | - | | | | 22 | 2 | 6 | 21.7 | | | |
| | | Foil @ 1d per lb | | | 1 | 5 | - | | | | | | | | | | | | | | | | | | | |
| | | | | | 19 | 7 | 6 | | | | | | | | | | | | | | | | | | | |

Foil is taken at 1d per pound of sweets to be wrapped - i.e. 240 x 1d = £1. 5. -.

NOTE:- All figures used in this example are fictitious.

used can be accurately determined because all boxes used are made by the firm's own boxworks and all these boxes have been costed. The packing costs (both labour and overhead), have been determined on form H - the labour rate per hour is used - the rate per box having been determined under the incentive wage scheme, e.g. if the standard for any one particular line was set at the packing of ten, four pound, boxes per hour, then the labour and overhead rate per box would be threepence per box or .75d per pound, taking the labour and overhead rate to be two and sixpence per hour and assuming standard task has been achieved - almost invariably the case. Thus the completion of the costing would be as follows:-

| | |
|---|----------------|
| Cost of the wrapped, chocolate covered nougat per pound | 21.7d |
| Packing costs per pound (determined as described above) | .75d |
| Cost of box per pound weight of contents | <u>1.25d</u> |
| | 23.70d. |
| Plus 10% Administrative and Selling Expenses | <u>2.37d</u> |
| | <u>26.07d</u> |
| Therefore the cost of chocolate covered nougat | 2/2d per pound |

This cost per pound is then entered in a permanent reference book so that, at any future date, the cost of the line can be easily found. If, however, further cost details of the line are required, e.g. the percentage chocolate coverture, it will be necessary to refer to the actual costing sheets and these are therefore filed away alphabetically for easy reference. It should be noted that these costing sheets are not filed away according to the order numbers as

the order numbers may be repeated five or six times during the course of any one particular year.

B. Mixtures and Selections. The costing of the mixtures and selections though involving more work than the costing of any one particular line, does not result in any greatly increased complexity. Assuming a chocolate assortment of six different varieties is to be costed, component lines A, B, C, D, E and F, the first step will be to determine the cost of each particular component in the assortment. This is done in exactly the same way as the example on form J. For example let it be assumed that the costs of the components are as follows:-

| | | | | | |
|-------------|-------|----|-------|-----|--------|
| Component A | costs | 24 | pence | per | pound. |
| " | B | " | 30 | " | " |
| " | C | " | 20 | " | " |
| " | D | " | 36 | " | " |
| " | E | " | 20 | " | " |
| " | F | " | 24 | " | " |

The next step is to examine a box of the chocolate assortment and to weigh each of the six components. Let it be assumed that it is found that the sweets A, B, C, D, E and F appear in the proportion 3, 2, 4, 2, 3, 2 respectively. From this information, a simple proportion calculation as illustrated below gives the cost of each variety in one pound of the chocolate assortment.

| | |
|---|---------------|
| Cost of component A in one pound of the selection $\frac{3}{16}$ of 24d | 4.58d |
| Cost of component B in one pound of the selection $\frac{2}{16}$ of 30d | 3.75d |
| Cost of component C in one pound of the selection $\frac{4}{16}$ of 20d | 5.00d |
| Cost of component D in one pound of the selection $\frac{2}{16}$ of 36d | 4.50d |
| Cost of component E in one pound of the selection $\frac{3}{16}$ of 20d | 3.75d |
| Cost of component F in one pound of the selection $\frac{2}{16}$ of 24d | <u>3.00d</u> |
| Therefore cost per pound of selection.. | <u>24.50d</u> |

Once this figure has been calculated, the same procedure is followed as regards the adding of packing costs etc., as in the case of single lines, viz.:

| | |
|---|---------------|
| Cost of chocolate selection per pound | 24.50d |
| Packing costs per pound | 1.00d |
| Cost of box per pound | <u>3.50d</u> |
| | 29.00d |
| Plus Administrative and Selling Expenses of say 10% | <u>2.90d</u> |
| | <u>31.90d</u> |

Therefore the cost of the chocolate assortment is equal to 2/8 per pound.

It is submitted that the costing system as described above has worked very satisfactorily in practice and has made a great deal of information available to the firm, and as will be seen in the chapter on sales, it has played an extremely important role in the establishment of a sound pricing policy. Despite the success that has been achieved, it is submitted that there are still many measures which could be successfully applied to increase the accuracy of the system. First of these is the introduction of a sound budgetary control system, unfortunately a very remote possibility at the moment because accurate production records have been kept by this firm only from early 1954. As the systems of production control and cost accounting introduced by the efficiency expert develop, this information will become available and, it is hoped will form the cornerstone of what should be a sound budgetary control system. Secondly, there is the problem of variables. The costing system as described above does not take into account fluctuations in the prices of raw materials, labour, etc. This problem has been partially overcome, however, by a periodic revision of basic data used in the costing system. This problem is most

acute in regard to the price of chocolate, as the prices of the basic raw materials, viz. cocoa butter and cocoa beans, fluctuate almost daily. In this case, though, the problem has been overcome by purchasing a year's needs in advance and basing the price of chocolate on the average price for the materials which have been purchased in advance. Regarding variables affecting overheads, the best that can be done is to revise the departmental labour and overhead rates bi-yearly taking into account any marked changes or the prospect of any future changes. Despite these problems, however, the present costing system, it is submitted, is a vast improvement on all the older methods employed by the factory.

5) An Appraisal of the Present Production Planning, Control and Costing Methods Employed in the Firm.

It is difficult to give an appraisal of the methods employed in this firm as described in this chapter, without resorting to facts and figures, but this would duplicate much of the matter described in the concluding chapter of this work. The costing system as applied in this firm has been dealt with in full and the accuracies and limitations of the system have been mentioned. The Directors of this firm have all expressed confidence in this system, and since the beginning of 1954, the results of these costings have been increasingly applied in the fields of both sales and production control. The importance of these costings in regard to sales will be fully dealt with in chapter nine of this Thesis, but it is of very great interest to note the extent to which information derived from the costings is employed in the field of production control of this firm.

At one period in the history of this firm, new lines would be developed and the selling price determined in a rough and ready fashion (usually by reference to competitors' prices). If the line did not sell well, it was withdrawn after a time, but if the line gained a large market and began to sell exceptionally well, the Directors of the firm would at once suspect they were "giving too much for too little" and either increase the price of the line, or possibly reduce its size in order to obtain maximum benefits. Obviously, this policy had a very adverse effect on sales. Ridiculous as this procedure may seem, the suspicions of the Directors seemed to have some foundation as the costing system subsequently proved that many of the "good sellers" of the firm were being sold at a figure below cost. Whether the goods were sold at a loss or not, however, the policy of changing either the price or the size of the line, (and, sometimes both), did nothing to further sales, and it is in this field that the costing system has made a vital contribution to the development of the production control of this firm. All new lines are now costed before being marketed and should the cost of the line exceed its proposed price, the size of the line is altered before marketing until such time as the proposed price yields a satisfactory profit margin. Furthermore, in regard to the production of count lines, the costing system plays an extremely important role in that costs are only applicable to count lines of a definite fixed weight, and therefore (in addition to any other advantages to be derived from keeping the weights of count lines constant), all factory personnel strive to maintain the pre-determined count line weights in order to ensure that the costings are kept accurate.

As regards the present system of production planning and control, very little can be said except that it has been found to work admirably. The whole success of this system lies in the centralisation of the system in the hands of the Production Manager. The flexibility allowed the various factory foremen, however, avoids over-centralisation, and because all foremen immediately inform the Production Manager of any difficulties that arise, automatically ensures that the production in the factory is maintained at a high and well organised level.

Both the costing and planning and control systems link up very closely in that it is essential that a proper system of planning and control be instituted so as to provide the information so necessary for a cost accounting system. Indeed, it has already been shown how heavily the costing system relies on information such as that recorded on the various manufacturing returns and recipe sheets. As more and more information becomes available, it is certain that both the costing and planning systems will be further developed and the advances made during 1954, will be only a stepping stone to as near as perfect a system of scientific planning and control as is possible.

CHAPTER 8.

THE INCENTIVE WAGE SCHEME.

1 - The Type of Incentive Wage Scheme Introduced, and the Methods of Wage Fixation.

The introduction of an incentive wage scheme marked the last phase of the efficiency expert's work (in creating a sound system of scientific management) at this firm. The incentive scheme once introduced was expected to have a beneficial effect by increasing the output of the firm. This, indeed, has been the case. No matter how desirable the introduction of the scheme may have been, however, the efficiency expert realised that the incentive wage scheme could not be installed until such matters as production control had been put on a sound basis. Production control in addition to playing a considerable part in its own right, played an even more important role in providing the basic data so necessary before a system of bonus wage payments could be introduced. Thus, no matter how keen the efficiency expert might have been to introduce the incentive wage scheme, he could not at first have done so, owing to the lack of any accurate production records. Because of the lack of information therefore, the incentive wage standards (both for groups of workers, as well as for individuals), were based on information gathered by the efficiency expert himself, with only an occasional reference to previous records of the firm. This automatically ensured that the standards were based on accurate and up to date information, gathered by an expert in his field, and not from persons such as the Factory Manager who, though

being capable in their work, were hardly qualified to institute and maintain a system of accurate production records. Up to the end of 1953, one of the basic weaknesses of the firm was that people such as the Factory Manager, were expected to do statistical work or, in some cases, even to provide the Directors with an estimate of the costs of the various lines produced by the firm.

The basic principle underlying the incentive wage scheme is that once the standard has been set, employees can earn a bonus in full proportion to the amount of work completed. To illustrate - if a standard was set at the packing of ten boxes of chocolates per day, and an employee packs fifteen boxes, then that employee would earn a 50% bonus. While the employers did not share in the bonus earned by the employees, they nevertheless obtained certain benefits:-

1. An increase in factory production of over 20%;
2. A reduction in overhead costs per pound weight of sweets produced;
3. As the standards were in some cases set at higher levels than previous production, goods in excess of the old production level and below the standard set, were free of labour costs.

This latter point should not be taken to mean that employees were in any way penalised but in some cases it was found impossible to set a standard based solely on previous production, as some employees would then have been able to earn a 200% to 300% bonus, whilst others would only be able to earn about 10% or 20%. This would have led to petty jealousies among the workers, complaints to the trade union and probably to the abandonment of the entire incentive wage

scheme. For example, it was found on examination of past production records (both those of the efficiency expert and prior records), that girls used to pack about twenty boxes a day of the well known "XXX Mints". Therefore if the standard were to be set based solely on previous records, the standard should have been set at sixteen or seventeen boxes a day in order to allow employees to earn a bonus. By means of time study, however, it was found that workers could pack far more than twenty boxes a day. After allowing for matters such as the time required by workers for personal needs, the fact that workers worked harder because they were being watched, (not so much because they were being timed), the standard was set at twenty-eight boxes a day. The wisdom of setting the standard at this level has been proved in that employees now pack thirty-four to forty boxes per day.

Two types of incentive wage schemes are in operation in the factory, viz.:

1. Group bonus schemes; and
2. Individual incentive schemes.

In the case of group incentive schemes, experiments were first made in the marzipan and boiling departments in order to examine the practicability of the schemes. It was only after these incentive wage schemes had proved practicable that it was extended to other factory departments. The standards were based on production during the first six months of 1954 and also by occasional reference to previous years' production in those departments, though as has been mentioned earlier in this chapter, these latter figures could in no way be looked upon as being reliable. The average weekly production figure for the department concerned was then established on this basis.

This average provided a figure which formed the basis of the establishment of a standard and which was then altered in the light of what possible maximum the departments' production could be expected to attain. For example, if the average weekly production figure of marzipan department was found to be five thousand pounds, whilst during two peak periods of every year the production figure amounted to seven thousand pounds, then the standard set for this department would be in excess of five thousand pounds, say six thousand pounds. The reason for setting the standard at this higher level is to take into account the extra production which results at busier periods of the year such as Easter and Christmas. As a result of the standard being partially set on the subjective judgment of the efficiency expert, the bonuses earned there by the various departments were not so large as to be farcical - there was a co-ordinated inter-relationship between the bonus earned by one department, and the bonus earned by other departments.

Though this system may seem unfair to the employees in that standards have been set at higher levels than their previous average production, it must be realised that the possible maximum production must be taken into account in setting a standard, because maximum production under a non-incentive system does not necessarily co-incide with the maximum production under an incentive wage scheme. Indeed it was expected that the maximum output of this department could exceed ten thousand pounds per week. Thus to have set the standard at five thousand pounds per week, would have enabled a 100% bonus to be earned during periods of extreme activity. It can be seen that even the higher standard of

six thousand pounds in this case would while still allowing a substantial bonus to be earned during peak periods, ensure that an average bonus of 20% to 30% would be earned normally throughout the rest of the year. These latter percentages were the figures at which the efficiency expert aimed in setting the departmental standards. Obviously a great deal depended on the subjective judgment of the efficiency expert, but his decisions were never made without ample thought and opinions from other factory personnel. That this system works smoothly is borne out by the fact that the departments in the factory normally earn the desired bonus figure.

Naturally the bonus scheme could not be operated without reference to the number of people working in the department and a register is now kept of all the employees occupied in each department. This figure can easily be converted into departmental man hours by multiplying the number of employees in any department, by forty-four, (the number of working hours per week per employee).

Once the standard output had been determined, i.e. six thousand pounds in this example, details were obtained of the average number of people working in the department over the time period under investigation. For example, let it be assumed that there were on the average ten workers in the department, then 440, i.e. 10×44 , man hours were worked per week in that department. To obtain the standard per man hour, the weekly standard of six thousand pounds was divided by four hundred and forty, and the rate per man hour was set at 13.6 pounds per man hour, i.e. $\frac{6000}{440}$ pounds. Once the standard per man hour had been determined, the calculation of the incentive earned per week is very simple.

Each day a register of employees' attendance in each department is sent to the Production Manager, who then calculates the number of man hours worked in the department on that day. For example, assume that a certain department has twenty-eight employees, and that on the particular day in question, one employee was present at work for only five hours. Further let it be assumed that the day in question happened to be a Friday, i.e. an eight hour working day. Then the number of man hours worked in the department on that day is 216, i.e. 27×8 man hours plus a further five man hours, the number of hours worked by the one person who was absent for the other three hours. Thus to calculate the standard for that day, the total number of man hours is multiplied by the standard per man hour for the department; assume fifteen pounds per man hour in this example. Then the standard for the day is equal to 3,315, i.e. 221×15 pounds. From the manufacturing return - form E, the Production Manager is able to determine the actual output for the day from that department; e.g., assume 4,200 pounds is delivered. Then the bonus production for the day is $4,200 - 3,315$ which equals 885 pounds. This information is then recorded on form K for each day of the incentive week (which, in order to coincide with the factory wage week, commences on a Tuesday), and at the end of the incentive week the total bonus earned is worked out by either deducting the total standard for the week from the total actual production for the week, or by simply adding the daily bonus earned for each day of the week - the two ways should always yield the same result as any difference indicates an arithmetical error which must be corrected before the bonus for the week can be calculated.

To obtain the percentage bonus earned by the department as a whole, the bonus earned (see for K) is expressed as a percentage of the total standard for the week, i.e. 19,215 pounds. This figure of 22% in the example, when expressed as bonus hours (obtained by taking 22% of the number of working hours in any week, i.e. 22% of forty-four hours), gives a result of nine and three quarter bonus hours to each employee in the department provided that the employee has worked the full week, i.e. forty-four hours. This figure of nine and three quarter hours is solely for the workers benefit, as some of them are unable to understand the percentage system. The percentage figure, however, is the one used by the Production Manager, in calculating the bonus for each employee. For this purpose a table of percentages and wage rates has been drawn up which gives the percentage bonus for any particular wage rate. The bonus is paid on the total wage rate of the employee (i.e. on basic pay plus cost of living allowance), and thus an employee if he works the full week, would get a 22% bonus or nine and three quarter hours extra pay for that week. In the case of an employee who had worked say only thirty-five hours, his bonus would only be 22% of 35 hours, i.e. seven and three quarter hours bonus pay.

One of the main advantages of the system as described above, is its relative simplicity, and it can therefore be easily understood by the workers themselves. Each department has a copy of form K posted on the departmental notice board, and each day particulars are filled in so that the workers are constantly aware at any time of whether they have exceeded standard production or not. The bonus hours earned,

however, are not calculated daily as it would take too much time and would be constantly changing after each days' production, and so the figure is only worked out at the end of each incentive week.

The method of setting standards for individual operations was somewhat different to that of the group bonus schemes, in that the efficiency expert had no information whatsoever to guide him. The actual standards were based on information derived from the three following sources:

- a) Information collected by the efficiency expert himself as regards the work done by individual employees.
- b) By getting an established fast worker to do the work for a certain period of time without interruption.
- c) By simple time study.

The information obtained under (a) gave some indication of what the average output per worker was, (b) provided information as to the maximum a good worker could be expected to perform in a certain period of time, and (c) gave the efficiency expert an indication of what the average worker performing the operation could do whilst being watched. Information obtained from the above three sources was extremely reliable, the information obtained under (b) was particularly helpful as the worker doing the test run would be either a group-leader or a forewoman, who though being skilled in the test operation, had no material interest in working below her maximum capacity because under normal circumstances, she would never perform the work which was being tested, but be supervising the other workers who actually performed the operation.

Once the information required was obtained, the standard was set by the efficiency expert using his subjective judgment, based on the information obtained from the above three sources. The standard was then set by means of three steps. Firstly, a standard per day was set. This was usually well above the average output of the workers in the past, but also well below the output of the group leader or forewoman in the test run. This standard was then compared with what the standard would have been if based solely on the time study. After an examination of the two figures, a standard per hour was set which was finally reduced by about 10% to allow for the personal needs of the workers concerned. Once again the desired aim of the efficiency expert was that a 20% to 30% bonus should be earned. Obviously in the case of individual workers, the capabilities of the workers vary tremendously and, therefore, as can be expected, the bonus earned by workers on individual operations varied far more than those of workers involved in the group bonus schemes. Results have consequently proved that the maximum bonus capable of being earned by employees on the individual bonus scheme is as much as 100% whilst only in one instance has a group bonus rate of over 50% been earned, usually being something more like 25%.

The individual incentive production information is written up daily in much the same way as is the case for the group incentive schemes on form K, except that the ultimate bonus earned by the employee cannot be expressed as a percentage of standard, as the worker may have performed three or four different types of work during the course of any incentive week. Because of this, a piece rate is worked out for

each one of the different operations under the incentive scheme as follows.

All qualified workers, (i.e. workers having had eighteen months experience in the sweet industry), receive a rate of eighteen shillings per day (inclusive of the cost of living allowance); therefore, if the standard is set at the packing of thirty-six boxes of a certain type of chocolates per day, then the piece rate per box is $\frac{18}{36}$ /-, i.e. sixpence per box, which is the sum paid out in the form of bonus for every box packed above standard. In a similar manner, piece rates are set for all the other types of work to which the individual incentive scheme applies. It is, thus possible, to calculate the bonus earned by any worker though that worker may have performed several different operations during the course of the incentive week. It should be noted that because piece rates are paid, the workers are paid in full proportion to their output over standard but instead of the bonus being expressed as a percentage, it is expressed as an actual sum of money.

Copies of form K are also posted in departments of the factory where there are workers engaged in work which can earn them an individual bonus, so that workers on individual incentive operations can also note their progress in regard to bonus earned at the end of any particular day. Owing to the simplicity of the incentive wage scheme, and because all workers are fully informed how the scheme works before they commence work which can earn them a bonus, it is only on rare occasions that any queries arise.

It will be appreciated that the success of the scheme

depends on detailed records being kept. Departmental foremen are responsible for filling in the daily manufacturing returns (form E) correctly, and for keeping the Production Manager informed of the workers earning individual incentives, as well as the daily output of these workers. The factory office (under the supervision of the Factory Superintendent), is responsible for keeping registers of the number of workers in each department, and recording the transfer of workers from one department to another, as well as all related information such as the number of workers working overtime in each department and the number of hours worked by each one. All this information is essential in calculating the number of man hours worked per day in each department of the factory and hence it is essential in the calculation of the group bonuses.

In addition to the above detailed application of the incentive wage scheme, there are certain general principles which are applied to the scheme as a whole. The most important of these are as follows:-

1. For the departments to which the group incentives apply, the standards were based on the previous average production, and to earn a bonus these groups must produce above the standard output on the average, i.e. over a period of time. Thus if the group fails to reach standard output in any one week, the deficit must be carried forward to the next week, and the department must make up this deficit in their production before bonus production can be considered. Another reason making it necessary to carry forward this deficit, is the fact that the work in progress at the end of each incentive week varies considerably. Sometimes several thousand pounds weight is practically finished but not due for delivery until the following incentive

week. It is only considered as production when it is delivered so bonus production will fluctuate according to scheduled delivery dates, and may quite easily be negative one week and be the opposite extreme the following week. The average production over a period is the important factor, therefore, a deficit in one week must be carried forward to the next week.

It is conceivable that a deficit (i.e. below standard production) may occur in two or three successive weeks. In this case, purely from the point of view of not demoralising the group, the earlier deficit is not carried forward. For example, if a group is two thousand pounds weight below standard in any one week, and three thousand pounds below standard the following week, then the group is actually five thousand pounds weight in arrears of standard. Only the three thousand pounds deficit, however, is carried forward into the following week. If in this week the group exceeds standard output by five thousand pounds, the nett amount counted as bonus production for that week will be the five thousand pounds less the arrears of three thousand pounds, i.e. the bonus production for the week will be two thousand pounds.

Every effort is made to avoid complications such as described in the previous paragraph; therefore the Production Manager attempts to plan his production so as to afford the group incentive members the opportunity of earning some bonus every week, rather than allowing workers to earn a large bonus one week and no bonus the following week. In the case of small sub-sections of departments with only four or five workers, for example, any weekly deficit that may arise is not carried forward into the following week as the standards in such cases were not based on previous average production, but rather on data obtained from time studies and from the results obtained by testing established fast workers. The work in process at the end of the incentive week in these small sub-sections is not large and every effort is made to ensure that all completed production is delivered by the end of each incentive week, in order that the group may receive the full amount of bonus due to them for that week.

- 2) Certain employees within the groups entitled to earn incentive payments are not in any way connected with production, e.g. floor-sweepers, and these individuals therefore do not receive a production bonus. If the department floor-sweeper is absent, however, his work still has to be done, and some production is lost because other workers lose labour hours in doing this non-productive job of work. Therefore, in calculating the standard for any department on any day, the floor-sweeper is included in the number of employees present. If the floor-sweeper is absent, the standard is thus automatically reduced, for the standard is directly proportional to the number of employees present - this factor has been allowed for in the setting of the standard. It may be argued that people engaged in work such as floor-sweeping should not be included in the bonus scheme, as such workers receive no bonus pay. It must be noted, however, that though such work is unproductive, it is essential work and should the floor-sweeper be absent from work on any one particular day, another employee will have to take his place. Consequently, there will be a loss of output. Thus the position that persons such as floor-sweepers, though receiving no bonus, are taken into account when the daily departmental production standard is calculated.
- 3) Individual incentives are computed on a weekly basis, and although daily progress may be recorded, it is on the weeks' performance that the bonus is based. This is to allow for the fact that in any one day, an operation may not be fully completed - a large amount of the goods may be almost but not completely finished - and it is not until the goods are completed that they can be regarded as production for calculating incentive earnings. At the end of every incentive week, an effort is made to have all work in progress completed so that employees will receive full credit for their performance during that week.

- 4) In order to encourage new workers engaged on individual incentive work, to improve their performance sufficiently to produce more than the standard which initially may appear to them to be far beyond their reach, a special reduced learner standard of 75% to 80% of the actual standard may be applied for a period of two to four weeks. The employees concerned are made to understand that such learner standards will apply only for a strictly limited period. Alternatively, instead of reducing the standard, learner employees may be granted a nominal bonus of about five shillings provided improvement is evident in their work. Indeed, this latter system applies also to the older employees who may initially find it difficult to attain the standard required.

- 5) Because all the standards (both for groups and individuals) are converted to a rate per hour, the fact that workers may only work a few hours on a certain day presents no problem, as the standard for the number of hours worked : is obtained by simply multiplying the standard per hour by the number of hours worked.

- 6) In working out a standard, it is often found that the standard for the time worked, may amount to an odd number, e.g. forty-six and one half boxes to be packed in a day. In such cases, the benefit is always given to the workers. In the above example, the standard would be reduced to forty-six boxes. The reasons for this are twofold. Firstly, the reduction in the standard is comparatively insignificant and it has been found from past experience that the workers are extremely appreciative when they are given the benefit in such cases, their confidence in the whole incentive scheme appears to be fortified. Secondly, it only involves a few extra shillings bonus payment per day from the point of view of the firm, and thus though the financial considerations involved are negligible, the psychological effect on the employees is very great. Indeed on several occasions workers have expressed their appreciation to the Production Manager on the above

procedure being followed where an occurrence such as that described above has arisen.

The incentive wage scheme as described above has given considerable satisfaction both to employers and employees, and though at times difficulties have arisen, they have been tactfully and satisfactorily settled. The success of the incentive wage scheme, it is submitted, has been based on the realisation that bare figures in themselves are not sufficient. In dealing with employees, one is not dealing with a mere mass statistics, but with a large group of human beings whose main interest is to earn bonus pay so as to be able to give their families additional benefits. Because of this understanding and trust between employer and employee, the latter have realised that at times (such as during the first half of the year) no large bonuses can be earned because of the general slackness in the sweet industry, and that the large bonuses earned at periods such as Easter and Christmas, must therefore be looked upon not as a mere bonus, but also as a dividend for the other periods of the year where they may possibly be unable to earn a bonus.

2. The Difficulties Encountered in Introducing and Administering the Incentive Wage Scheme.

The problems connected with the incentive wage scheme can be divided into two classes:-

- 1) Difficulties in introducing the scheme.
- 2) Difficulties in carrying out the scheme.

1) Difficulties in Introducing the Scheme.

The principle difficulties encountered in introducing the incentive wage scheme arose as a result of arguments put forward by the local branch of the Sweet Workers Trade Union. Most of the fears expressed by the trade union were based on difficulties encountered in introducing incentive wage schemes in other industries in the same town as this firm was situated, e.g. the clothing industry. These incentive wage schemes had not worked satisfactorily and, as a result, had led to a great deal of industrial unrest in those firms where the schemes had been applied. The main reason for this unrest appears to have been a widespread belief among employees that the incentive wage schemes were introduced solely for the benefit of employers and that even if the scheme were to function to both the employers' and employees' satisfaction, it would ultimately lead to the retrenchment of a certain number of workers. This line of argument was obviously brought about by a lack of understanding by both the various trade unions and their members. Nevertheless, the trade union concerned with this firm was definitely influenced by these industrial disturbances which had occurred in this town. The arguments advanced by the trade union against the introduction of an incentive wage scheme in this firm were as follows:-

- a) Whilst they admitted that a fair incentive wage scheme should lead to an increase in production and to increased wages for employees, the trade union expressed very strongly the fear that, as a result of the increase in production, certain workers would become superfluous to the firm, hence the introduction of such a scheme would lead to unemployment. This argument was

countered by a guarantee on the part of the firm that no workers would be dismissed because of the higher production that might result from the introduction of the incentive wage scheme. At the same time, however, the firm made it clear to the trade union that they would not be bound to replace workers leaving as a result of natural labour turnover. This was accepted by the trade union.

- b) A similar problem to that described above was the trade union fear of its members having to work short time, e.g. possibly only four days a week instead of the normal five. This was a very sound argument as the sweet industry in this country is at times subject to slack periods of business activity and therefore the temptation does exist to put workers on short time. It was pointed out to the trade union, however, that the incentives would not lead to any short time being worked (other than what had been worked in previous years) because the labour force of the firm would be allowed to drop naturally as production increased under the influence of the incentives. Secondly, though slack periods were inevitable, this was only applicable to the sales of chocolates and mixtures, and not to the production of count lines for which there is an all year round insistent demand, which this firm had never been able fully to cope. Thus the firm would make it a policy in periods of slackness to transfer workers to this type of work. The trade union was not particularly satisfied with this reasoning, mainly because of the inability to differentiate between normal short time and what short time would result from the introduction of incentives. As results consequently proved, however, there was if anything a reduction in short time once the incentive scheme had been introduced. The reasons for this reduction in short time was that the factory labour force was allowed to remain at a comparatively low level; thus, there was sufficient work for the smaller staff.
- c) The setting of the standards also gave rise to some doubts on the part of the trade union, but these doubts were removed when the efficiency expert

informed the trade union that he would attempt to set all standards so that workers of a reasonable calibre could earn a 25% bonus per week, based on their basic wages plus cost of living allowance, not merely on the basic wages of the workers as had been the case in other firms where incentive wage schemes had been applied, in the town in which this sweet factory is situated. Further, it was pointed out to the trade union that an incentive wage scheme could only be expected to work satisfactorily if all workers affected by the scheme were satisfied, i.e. if they earned a reasonable bonus. It was in the firms' own interest therefore, to ensure that their employees remained satisfied so as to make a success of the incentive wage scheme.

- d) After all the above matters had been dealt with, the trade union advanced the argument that, owing to the comparatively small "buying population" of this country, the demand for this firm's products would be limited, thus the increase in production likely to be brought about by the incentive wage scheme, would merely lead to the building up of stocks and once again the danger of retrenchment of workers and the working of short time. It was then explained to the trade union that the basic reason for introducing the incentive wage scheme was to reduce the manufacturing costs of the products made by this firm, and that it was hoped that such savings as might eventuate could be passed on to the retail shops in the form of lower prices, and hence to the ultimate consumers. Thus, even though production would increase, it was hoped that the sales of this firm's products would increase at a greater or, at least, an equal rate. This answer was acceptable to the trade union, though admittedly with a certain amount of reservation.

All the above arguments put forward by the trade union are those that would be put forward by any other trade union that did not particularly favour the idea of an incentive wage scheme, but probably the most important reason for the trade

union's resistance to the incentive scheme, was that in the town where this confectionery firm is situated, wage incentives had been introduced into several other firms in other industries and a great deal of trouble had been experienced by both employers and employees. The main problem in these other firms appears to have been centred around the setting up of the various work standards and the working of short time. In the light of these unfortunate occurrences, the reluctance of the trade union to permit any system of incentive wages to be introduced into this firm, was understandable.

After frequent consultations between the trade union organisers, the efficiency expert and the executives of this firm, it was agreed that two departments, viz. the boiling department and the marzipan department, should be put on incentive wages for a trial period of about six weeks. If the scheme worked satisfactorily there, it was to be extended to the remainder of the factory. At the time, there was a considerable amount of work for both these departments and the trial period passed very successfully and, consequently, the system was extended to the remainder of the factory.

During the negotiations between the employers and the trade union, the trade union officers adopted an extremely reasonable attitude. Though they could not prohibit the introduction of an incentive wage scheme⁴, they could quite definitely have made matters extremely difficult, and in the long run, could have made conditions so unpleasant for the firm, that all attempts to introduce the incentive wage scheme would have had to have been abandoned. The trade union was

4 See footnote at bottom of Page 156

prepared to give the scheme a fair trial, though quite naturally maintaining their suspicious attitude. Fortunately since the time that the incentive wage scheme was introduced, it has functioned extremely satisfactorily and the trade union as a sign of their confidence in the fairness of the scheme, have allowed the Production Manager of this firm full discretionary powers to supervise the operation of the scheme in the manner as he sees fit.

2) Another main difficulty in introducing the scheme, was the complete lack of accurate production information so necessary for setting up standards in any system of incentive wage payments. This in many ways created more difficulties than the trade union itself. All production records prior to 1954 had to be discarded owing to the poor methods employed in recording production information, and the efficiency expert had to base his calculations on production information which he himself had collected during the course of his term with this firm. As a result, the standards obtained could not in any way be looked upon as being typical for previous years, so that the danger existed that the standards could possibly be based on information which was only relevant for a particular year. Subsequent results have shown that, fortunately, all the information obtained by the efficiency

4 Several comparatively recent attempts by this trade union to prohibit incentive wage schemes under the local sweet industry industrial council agreement, were vetoed by the Minister of Labour who refused to pass any industrial agreement between employers and employees (or employees' trade unions), prohibiting the introduction of incentive wage schemes.

expert was reliable as a basis for the standards, as all of the employees on incentive wages now earn the desired bonus. Owing to this lack of information, it took over four months before the incentive scheme was extended to most of the factory. Though four months may appear a short time for introducing an incentive scheme into a factory, it must be realised that this time period merely applies to the actual application of the scheme, and not to the considerably longer period spent in the collecting and collation of basic data.

2. Difficulties in Administering the Scheme.

Once the difficulties in introducing the incentive wage scheme had been overcome, it was applied to most of the factory either in the form of group bonuses or individual piece rates. Quite naturally as time passed, certain problems arose in connection with the incentive scheme, some of which have been solved and others which have only been partially solved. The following are the major difficulties encountered:-

- a) Probably the greatest problem in administering the scheme was because it could not be applied to the entire factory. The main reason for this was that in certain departments and in the case of certain individual employees, it was impossible to measure the efficiency of such department or employee with reasonable simplicity. Since the incentive scheme was working satisfactorily and in some instances, employees were earning a 50% bonus or more, it is not surprising that those employees not working under the incentive wage scheme, began to complain to the trade union that they too wished to take part in the system of incentives in the factory.

Because of this, a scheme had to be worked out to satisfy these employees. The basic principle underlying the scheme which was evolved, was a system of giving a flat rate bonus to these workers, i.e. it merely amounted to the granting of a form of wage increase. For example, the girls feeding the chocolate enrober were entirely dependent on work from other departments, therefore it would have been unfair to set a standard for these girls as the only possible (and probably frequent) reason for their not being able to earn a bonus, would have been that they did not receive sufficient work from the other departments in the factory. Thus each girl feeding the chocolate enrobers was given a flat rate bonus of seven and six per week (or one and six per day), dependant on the Production Manager receiving a favourable report from their foreman on the standard of their work during the week. If a girl's work is not satisfactory for any one day, this would be noted by the foreman of the chocolate department, and the worker would not receive the one and sixpence bonus pay for that day. In addition if a worker was absent for three or more days in any week, that worker would not receive any bonus for that week at all, though the employee's work may have been up to standard on the two days or one day that he/she was present at work. The aim was obviously to discourage absenteeism. At the end of each incentive week, the Production Manager receives a report from all the foremen having workers entitled to a flat rate bonus, regarding the standard of the work of the employees under this system and from these reports, the Production Manager calculates the flat rate bonus due to the different workers.

In addition to the above type of bonus, bonuses in the form of wage increases were given to employees occupied in work requiring a fair measure of reliability and skill, and where it was impossible to determine accurately the merit of the employees work. In such cases the bonus granted is in the form of an increase in wages and the full weekly bonus is given irrespective of the standard of the employee's work. Obviously in cases of inefficiency, the bonus of the worker would be suspended and the worker removed to a less responsible position.

It must be emphasised that the policy was not to give flat bonus increases to all employees not under the group or individual incentive schemes, but only in cases where production could be evaluated to some extent. For example some workers may have to perform eight or nine different non bonus jobs of work and in such cases, it is neither practicable nor possible to put such a worker on incentive nor to grant such a worker a flat rate bonus. The crux of the matter is that the work must be capable of being judged - even if it is only the subjective judgment of the factory foremen. In cases of responsibility, however, as mentioned in the previous paragraph the workers may be granted a flat increase, but here the increase is not dependent on the standard of the employee's work, but rather as a recognition for the employee's responsible position.

This granting of flat rate bonuses is, however, only a partial solution as there are still about fifty workers in a production staff of approximately three hundred and fifty, who cannot earn any type of bonus and in any case, the system of flat rate bonuses is, at best, a poor substitute for a proper incentive scheme since too much reliance is placed on the subjective judgment of the factory foremen. Secondly, workers receiving a flat rate bonus do not have the same incentive to increase their output as workers receiving a bonus which is directly proportional to their productivity.

- b) When the incentive wage scheme was introduced, the foremen of the departments were included in the operation of the scheme but this was unsatisfactory because:-
- 1) Many junior foremen earned larger bonuses and hence total wages than foremen of longer standing and this led to dissatisfaction among the foremen;
 - 2) Foremen could be more concerned with the quantity of goods turned out rather than with the quality.

To overcome this problem, each foreman was given a flat increase in wages. Thus, though the number of hours worked by the foremen are taken into account when calculating the number of man hours worked in the department, the foremen themselves are not paid any bonus. This has worked extremely well in practice as the foremen, though quite naturally still desiring the maximum output possible from their departments, maintain a rigid scrutiny of the quality of the goods produced.

- c) The question of overtime materially affects the incentive wage scheme and some action had to be taken to deal with this question when the problem arose. Where any department in the factory works overtime, the standard for that day is simply increased by the number of man hours worked overtime. All the workers working overtime are paid bonus pay on basic wages plus cost of living allowance plus overtime pay.

This, however, is only a partial solution as there remains the problem that, while the standard for the whole department is increased by the number of overtime man hours worked, it is usual that only a quarter or, at the most, half of the department work overtime. Thus it appears that the rest of the staff (which does not work overtime) are penalised because the standard is made higher through other people working overtime. This problem was further aggravated by the fact that the work for which the overtime is required is usually of a difficult nature and hence the output resulting from the overtime is usually less than the standard for the overtime hours worked. This overtime obviously cannot be ignored as it results in an increase in the department's output, and as it is impossible to separate overtime production from normal production, the standard for the day has to be increased to cover this extra production resulting from the overtime worked. This problem is as yet unsolved, but it has been reduced to negligible proportions because the increased production, resulting from the planning and the incentive wage scheme, has reduced the necessity for overtime to a maximum of

one hundred man hours per week, compared with the approximately twenty thousand man hours worked by the total factory staff during the week, i.e. it is now less than 1% of the total weekly man hours worked.

- d) When the departmental or individual standards were set, it was realised that these would have to be changed from time to time as more equipment was installed in the different departments. It is necessary to change the standards as the addition or removal of machinery materially affects the output of any department in the factory. This problem caused a fair amount of difficulty in that, though it was realised that the standards would have to be changed, it was at first found difficult to alter the standard to exactly offset the effect of the addition or removal of any machinery. The method finally adopted was, firstly, to estimate what change in production would result from the addition or removal of the machinery, and then to alter the standard to take into account this extra or diminished production.

For example, assume that a new piece of equipment has been installed in the starch department and it is estimated, after a thorough investigation, that the output of the department has increased by seven hundred pounds weight per week. Also assume that the incentive standard for that department is twelve and one half pounds weight per man hour, and that there are sixty-one employees in the department who each work forty-four hours per week, i.e. two thousand six hundred and eighty-four man hours. In order to increase the standard so as to exactly offset the increase in weekly production of seven hundred pounds, the procedure is as follows:-

| | | | |
|----------------------|--------|--------------------------------------|---|
| Increase in standard | equals | <u>Increase in Weekly Production</u> | |
| | | Weekly Man Hours | |
| | equals | $\frac{700}{2684}$ | equals $\frac{1}{4}$ pound; per man hour. |

Therefore the standard of twelve and one half pounds per man hour is increased by one quarter of a pound, to give the new standard for the department of twelve and three quarter pounds per man hour.

This system is the fairest possible one, the only weakness being that the change in weekly production has to be estimated. Errors are minimised, however, as the estimation is only made after an extremely detailed and thorough investigation.

- e) A further problem which arose in regard to the group incentive wage scheme, was that it was customary for foremen, not having sufficient work to occupy all the members of their department, to send these workers out to other departments where they could be usefully employed. In such cases, the number of man hours worked in the department sending out the surplus workers is reduced and thus, a certain amount of inter-movement of employees prevailed, even though the department may have been on the incentive scheme. As long as this situation occurs in a small way, no problems arise because the standard for the department can be reduced by the number of man hours spent working in the other departments by the department's workers. In some cases, however, where a department has only a very small amount of work, it sometimes happens that up to one third of the total man hours per week are spent outside the department. When the bonuses are calculated, all the workers are given bonus including those workers who have been sent out of the department because there was no work for them in their own department.

Thus, if a department has twenty workers, i.e. 20×44 prospective (assuming all workers to be present) man hours per week, but six workers, i.e. 6×44 which equals 264 man hours, are sent outside the department, then the incentive standard for the week would be based on $(20 \times 44) - (6 \times 44)$ man hours, i.e. $880 - 264$ man hours. It must be noted though that, though only fourteen people have worked in the department, the bonus has to be paid to all the members of the department, i.e. twenty employees. It is quite obvious that there is something wrong here because some workers will be

paid a bonus for work which they did not do. Unfortunately this position is unavoidable because if the workers sent out of the department were not paid a bonus, it would lead to friction between the foreman of the department and his workers, as well as among the workers themselves. In order to rationalise this problem of having to pay, as in this example, a bonus to twenty workers, while only fourteen really earned the bonus, but at the same time avoiding friction by ensuring that all workers in the department receive bonus pay, the following solution has been evolved.

Once the bonus for the week has been determined in the usual manner, the bonus is reduced by the percentage of man hours spent outside the department. Thus, in the above example out of a maximum of eight hundred and eighty man hours, six hundred and sixteen man hours are worked in the department and two hundred and sixty-four man hours outside the department. Presuming that a bonus of 25% is earned by the department, then the bonus is reduced by $\frac{264}{880}$ i.e. 30%. The nett bonus paid to the workers in the department would be the 25% bonus calculated in the normal way, minus (30% of 25%) i.e. 25% - 7.5% which equals 17.5%. Thus instead of fourteen workers being paid a bonus of 25% and six workers receiving no bonus at all, all of the workers are paid a bonus of 17.5%. This system permits as much interchange of labour as is necessary at any time, and does not penalise those workers sent out of their department because of lack of work.

In the case of departments on group incentives requiring additional labour, the problem is very much simpler than that described above. In these cases, the departments' standard is merely increased by the number of man hours spent in the department by the casual workers. This point is of little practical importance as most workers sent out of any departments are not normally sent to other departments working on incentive. In cases where workers are sent out of departments because of lack of work, the employees are put on casual work for which no incentive standard is laid down.

- f) In regard to workers on individual incentives, a constant problem has been the lack of understanding on the part of the workers that the greater the standard per hour, the lower per unit must the piece rate be. The workers in this factory tend to view piece rates on the basis that, the more units per hour they have to complete, the higher should the payment per unit be. (This problem still exists but a certain amount has been achieved by frequently explaining to the workers, as a first step, that if they were paid hourly instead of weekly, they would receive two shillings per hour worked). Then, taking the example of a standard being set at the packing of six boxes of a certain variety of chocolates per hour, the piece rate per box would be $\frac{2}{6}$, i.e. fourpence. In other words, workers would receive fourpence for every box packed over and above the standard for the time worked. Similarly, if the standard for another variety of chocolates was the packing of eight boxes per hour, workers would earn $\frac{2}{8}$, i.e. threepence per box over and above eight boxes packed in any hour. In other words, the higher the standard per hour, the lower the payment per unit. Unfortunately some of the workers do not seem able to grasp the above elementary explanation and, therefore, do not understand the relationship between the various incentive standards. It is hoped that in the course of time, however, that this problem will gradually be overcome as explanations are offered continually.
- g) A very important matter, to which as yet no solution has been found, is the question of granting allowances from the incentive standards in the case of the group incentive schemes, in the event of machinery or any other similar hold up in production, the fault of which does not lie with the workers. At present a rough estimate of the effect of the obstruction is made, and this estimate is deducted from the standard. At best, this is a very poor solution owing to the impossibility of calculating what the exact effect of the hold up on production is. The only consolation is that the estimate is not finally made until the position has been discussed with the foreman of the department concerned, and other personnel able to give information

likely to be useful; thus, these estimates, though not being extremely accurate, are unlikely to cause any dissatisfaction among the workers.

h) A final point, more a matter of interest than a problem, is that as time has passed and the success of the incentive scheme becomes assured, the fears of the trade union have been allayed, but as larger and larger bonuses were earned by the employees of this firm, the Directors of the firm became suspicious about the workings of the scheme and they have suggested that possibly:

- a) the standards were set at too low a figure; or
- b) incorrect weights were being recorded on the manufacturing returns (form E).

This attitude is quite understandable because at the time (approaching Christmas 1954, i.e. a period of extreme activity), the factory with about 10% less employees than previous years, was producing about 20% more than in previous years and in consequence, some of the workers were earning bonuses under the group incentive schemes of anything up to 75% of their week's pay.

The suspicions of the Directors as regards the incentive scheme necessitated many explanations being made to them. The principle aim of these explanations was to convince them that, as no department on incentive weighed its own output, the danger of entering false weights on the manufacturing returns was practically negligible. Secondly, the fact that the standards were based primarily on production during the first six months of 1954, (when production was relatively high as compared to production in previous years), ensured that if anything, the standards were set at a high level. That the firm was gaining large benefits from the incentive wage scheme was fully apparent to the Directors when, during the Christmas season of 1954, practically no overtime was worked in the factory though the factory staff numbered some forty to fifty employees less than in previous years. Yet despite these very obvious advantages, the Directors of the firm were concerned

because the benefits were not revealed in a monetary form in the monthly trading and profit and loss accounts. The main reason for this was that, just at that period, there was a marked increase in the other costs of the firm, notably railage, and these extra increases absorbed any benefits made as a result of the incentive wage scheme. In order to convince the Directors that the incentive scheme, in addition to yielding very apparent advantages to the firm, would also definitely be of great financial benefit, the following report on the advantages of the incentive wage scheme was issued by the Production Manager to the firm's senior executives. The aim of this report was to show that the incentive scheme could be expected to yield a clear profit of seven thousand pounds per annum in addition to certain non-monetary benefits. The report was as follows:-

REPORT ON THE ADVANTAGES OF A
WAGE INCENTIVE SYSTEM.

CONFIDENTIAL.

B A S I C D A T A .

| | Nov. 1953 | Nov. 1954. |
|--------------|-------------|-------------|
| LABOUR FORCE | 496 | 442 |
| PRODUCTION | 185,000 lbs | 204,600 lbs |
| WAGES | £2,426 | £2,700 * |
| BONUS WAGES | NIL | £398 |

* Note: £2,700 includes the bonus wages.

The above data is applicable to the last week in November 1953 and 1954 except for the production figure which is the average weekly production for the month.

- 1) Extra expense as a result of the operation of the bonus scheme equals £398. for the week.

- 2) If the bonus scheme were not in operation, factory average weekly production with a labour force of 442 workers would amount to 150,000 lbs. (This statement is based on the position in May 1954 when 449 workers - none of whom were on incentive - produced 150,000 lbs. weight of production).

Thus, because of incentive we are obtaining

$$\begin{array}{r} 204,600 \\ - \underline{150,000} \end{array}$$

i.e. 54,600 lbs.

weight of production free of overheads - or as in fact it has the effect of reducing the general overhead rate of the factory as a whole per lb. weight of sweets produced.

From Costing data it has been determined that the average overhead rate for the factory is $2\frac{1}{2}$ d. per lb. weight produced. This means the factory is saving in overheads $54,600 \times 2\frac{1}{2}$ d. per lb. per week = £570.

- 3) Thus the nett financial weekly gain to the factory of the wage incentive system =

$$\begin{array}{r} 570 \\ - \underline{398} \end{array}$$

£ 172.

Admittedly this is an almost maximum figure owing to the busy state of the factory at present and the high production figures being obtained. When sales slacken off (as they will in the new year) - this benefit to the factory is reduced - but the factory cannot be worse off than without the incentive system - it may be at the worst, the same as if no system were operating, but on the whole the nett benefit to the factory should be in the vicinity of £125 per week over the whole year, i.e. £125 x 48 working weeks in a year equals £6,000 p.a.

- 4) In addition at the end of each year there will be about 50 less workers to receive holiday pay - another saving of £500 p.a.

Further economies are facilitated because of less workers such as Sick Fund contributions by the firm etc.

- 5) In addition to the direct financial benefits the following advantages are consequent, none of which can easily be measured in terms of pounds, shillings and pence.
- (a) A definite increase in the feeling of goodwill between employer and employee.
 - (b) Labour turnover is down - this ensures a higher degree of skill from workers.
 - (c) There is no "panic" during rush periods such as at present, e.g. for the first time there has been no need for Packing Department to work overtime in order to cope with the Xmas rush.
 - (d) More care is taken in the production of goods as "bad" work has to be deducted from production for incentive purposes, the wrapping machines are a perfect example of an increase in production being coupled with an increase in quality.

CONCLUSION.

From the above it can be seen that wage incentives save the firm about £7,000 p.a. and give scope to the four points above.

The fact that this £7,000 does not immediately show up in the books of the firm has apparently caused some alarm. However, increases in the prices of raw materials, railage etc., should be taken into consideration and it must be observed that not only has the gain from the wage incentives the ability to increase profits by £7,000 - but also to reduce losses by a similar figure.

7th Decr. 1954.

It will be observed that an extremely conservative attitude is adopted in the report and no allowance is made for the profits on the extra production resulting from the incentive wage scheme. Yet, despite this report and the benefits which had already been experienced as a result of the incentive wage scheme, the Directors of this firm were still not completely satisfied that the operation of the scheme was yielding any financial benefits, though they could not argue against any of the points raised under point five in the foregoing report. Nevertheless with the passing of time, it is hoped to convince the Directors of the monetary benefits resulting from the incentive scheme, and it is certain that, once the sale of this firm's products equals the new production potential resulting from the incentive and planning schemes introduced, large profits will inevitably result. It is only in times of peak production that any incentive wage scheme will yield the fullest benefits.

3) A Comparison of the Incentive Wage Scheme Introduced into this Factory with the Requirements of a Sound Incentive Wage Scheme.

The following are the main essentials of any sound incentive wage scheme:-

1. The bonus earned by the employees should be in direct proportion to any increase in output resulting from the introduction of the wage incentives.
2. The plan must be simple so that it can easily be understood by employees.
3. Time wages should be guaranteed - workers should not fear that normal time wages will be reduced should the standard production level not be attained.

4. The bonus should be of a sufficiently high level so as to induce extra production.
5. The whole system must be definite - no ambiguity should exist.
6. Works methods should as far as possible be standardised.
7. The system must incorporate a rigid system of control so as to ensure that quality will not be sacrificed for quantity.
8. A fair measure of compensation must be applied in the advent of failure to reach standard, when the cause of the failure is beyond the workers control.
9. The plan must be firmly maintained - the system must be set so as to be permanent.

As far as possible the incentive scheme introduced into this factory has complied with all the theoretical requirements as listed above. The following is a description of the extent to which this firm's incentive wage scheme fits in with the above mentioned theoretical requirements.

1) Under the group incentive scheme all workers earn bonus in direct proportion to all work produced over and above the set standard, i.e. if a department produces 30% above standard, these workers earn a 30% bonus of their week's pay inclusive of the cost of living allowance. As far as the group incentives are concerned, there is no question but that the employees' bonus pay is considered in direct proportion to any increased output. As regards the individual incentive scheme, however, the workers only earn a bonus (in the form of piece rates) after they have attained the set standard, and as most of these standards have been set at higher levels than previous production (in order to maintain a relationship in the wages of workers on

the group incentives and those on individual incentives), the workers are not paid for production between the old level of production and the standard set for incentives. Once the standard has been achieved, however, the workers earn bonus in full proportion to increased output over standard. For example, assume that the old production level of packing a certain four pound box of chocolates was twelve boxes per hour, and that the standard was set at sixteen boxes per hour, then no bonus is paid until the sixteen boxes per hour have been produced, i.e. workers are not paid for merely surpassing the old production level - they have to pack more than the standard laid down - sixteen boxes per hour in this example.

2) It has already been mentioned earlier in this chapter that one of the basic aims of the incentive scheme introduced in this firm was simplicity. Daily records are posted up in the factory so that workers can calculate for themselves how much bonus they have earned in any week. The only time this incentive wage scheme becomes complicated beyond the workers ability to understand it, is in cases where standards have to be changed because of changes in the plant of the department for example. In cases such as this, however, the position is explained to the departmental foreman and to those of the workers who are able to understand the adjustment. The normal day to day workings of the incentive wage scheme, however, present no difficulties to the workers. All workers have been repeatedly told that, in the event of their not understanding any point in the scheme, they should approach the Production Manager, who would be only too pleased to explain it fully to them. It has been gratifying that many workers have approached the Production Manager and have consequently had their difficulties clarified.

3) One of the bases of this system is that production should be increased and, subsequently, the wages of the workers. All workers are guaranteed a weekly time rate and there is no question as regards these time wages being reduced should standard not be attained in any one week.

4) As has been stated earlier, the aim of the incentive scheme at its inception was that employees should earn a 20% to 30% bonus, i.e. a sufficient incentive so as to ensure that it would be worth the workers while to increase their production. In no cases have the workers as a whole undertaken a role of passive resistance to the incentive wage scheme because they thought the standards were set at too high a level. In two instances though, workers after being put on bonus, refused to work any harder, but this was because they did not understand the workings of the incentive scheme, quite literally, in that the more units they produced the more money would they be paid. Once the position had been explained, both workers produced more and finally earned a weekly bonus of about 30%.

5) In drawing up the incentive scheme, the efficiency expert realised the necessity of setting the standards definitely and on no account altering them because they were afterwards proved to be too low. Reducing standards obviously does not result in any difficulties arising from the workers. Thus a great deal of thought was given to the establishment of the standards before they were applied in the factory and in a few cases as regards the individual incentives where low standards had been set, these standards have been maintained rather than altered, as alteration would inevitably have led to the accusation that the employers were raising standards as soon as the workers began to earn bonuses.

6) In a factory, such as this one, a large variety of work is carried out and to standardise completely works methods, such as the movements of the workers hands, is an impossibility. A compromise had been attained, however, in that all workers doing similar operations, are given similar equipment and they are advised how to use the equipment in the best possible manner.

7) One of the points receiving the most attention before the incentive wage scheme was introduced in the factory, was that an adequate system should be instituted so as to ensure that the quality of the goods produced should be safeguarded during the attempts of workers to increase their output. In setting up this incentive scheme, provision was made that all work not considered as being of a sufficient quality standard, must be returned to the department which made the goods and deducted from the output of that department, i.e. no credit was given for faulty work under the incentive wage scheme.

Similarly in the case of the individual incentives, the workers were informed that all inferior work would not be allowed for incentive purposes. The system of quality control at present employed in the factory is that the foremen and assistant foremen inspect all work produced in their departments, ensuring that the quality of all work reaches the fixed standards laid down by the Factory Supervisor. Should the foreman of any department send work of an inferior quality out of his department, the departmental foreman receiving the goods usually notices the defect and either returns the goods or, in cases of doubt, requests the Factory Supervisor to examine the goods.

The foremen and employees in the factory make every effort to maintain quality as well as to increase quantity

as it has been explained to them that inferior work would result in charges being laid at the incentive wage scheme as the cause of the decline in quality, and this might well ultimately lead to the abandonment of the incentive scheme. As a result of this latter argument, the quality of the work produced in the factory has generally improved with the introduction of the incentive wage scheme. Quite naturally at times the quality of certain of the goods produced in the factory does deteriorate not because of the incentive scheme, but owing to such factors as adverse climatic conditions which in any case leads to work of a poor quality being turned out. It is also of interest to note that, in cases where this has occurred, the first factor, to which the Directors of this firm have attributed the blame has been the incentive wage scheme.

8) The weakness of this system in determining accurate compensation for the loss of production as a result of the factors beyond the workers' control has been fully dealt with earlier in this chapter. In practice it is extremely difficult to make an accurate calculation of the amount of work by which the standard should be reduced - the only alternative is to make as fair an estimate as is possible.

9) In order to ensure the permanence of the incentive wage scheme, records have been compiled of the various standards and how they have been set, of the data collected during the course of compiling the information for the setting of the standards and the results that the incentive scheme has yielded. Even during slack periods in the sweet industry the incentive scheme in this factory has not been suspended, though it has been known that only

small bonuses would be earned by the factory employees. The constant aim is that not only should the present incentive wage scheme be maintained, but that as the scheme becomes firmly established, it should be applied to more and more jobs of work not yet under the scheme, so that ultimately all employees in the factory, will have the opportunity of earning bonus wages.

It is submitted that it will be noticed from the above points how closely the incentive wage scheme introduced into this firm agrees with the theoretical requirements considered necessary for the smooth operation of any incentive wage scheme. The very fact that the scheme has survived the innumerable difficulties previously described, gives some indication of the soundness of the scheme and of the future prospects that lie ahead. The scheme, as introduced into this firm, has yielded benefits to both employers and employees, and as a better understanding of the scheme is attained by the Directors, the possibilities of the scheme will be fully appreciated. The position at present is that the incentive wage scheme, while being unreservedly accepted by the workers, is accepted by the Directors but only because of the benefits that have already been experienced. The most important of these benefits have been a reduction in the total number of factory staff while there has been an increase in production. The Directors, nevertheless, are still not entirely convinced that the scheme will result in any financial gain - believing that all savings are paid out in the form of bonus. This belief is disproved in the concluding chapter of this work.

4) An Appraisal of the Incentive Wage Scheme.

The incentive scheme, introduced in June 1954, has, at the time of writing, been in operation for one year. During this period, as has been shown above, many problems have arisen and some solutions to the difficulties have been found. The results of this scheme (dealt with in chapter ten of this Thesis) have been extremely gratifying and generally have made all factory personnel acutely aware of the advantages that an incentive wage scheme has to offer. Even the Directors of the firm, though not entirely convinced of the financial benefits that can be obtained, firmly believe that the incentive wage scheme coupled with the production planning and control schemes, has facilitated and increased production throughout the factory, thus ensuring that warehouse stocks will be kept at the desired level.

Possibly the whole reason for the success of this scheme, it is submitted, is the fact that there has been a marked spirit of co-operation between employers and employees. Initially neither the employers nor the employees were over enthusiastic about the introduction of an incentive wage scheme, but both parties were prepared to give the efficiency expert an opportunity to introduce the scheme. When difficulties arose they were dealt with calmly and fairly. The instruction of all employees in the workings of the incentive scheme proved to be a wise move, because they were thus given the opportunity to state their point of view and express any doubts which they may have had. Quite naturally once the management of this firm knew these doubts, it was easier to re-assure the workers and dispel their fears. Indeed,

in many instances, employees brought forward technical points which the efficiency expert had not thought of and it was possible to include these matters in the scheme before they gave rise to any problem.

A great responsibility rests on the Production Manager because he is the one who plans the factory production, and it therefore depends on his scheduling of orders whether departments do or do not earn a bonus. The Production Manager attempts to plan production so that, as far as is possible, the work is so scheduled to allow each department to earn a fair bonus every week, rather than a large bonus one week and no bonus at all the next week. The Production Manager keeps in constant touch with the Warehouse Supervisor and so is aware of any opportunities which may arise of providing work for any of the factory departments which may be experiencing a period of slackness. It is realised that, if workers are unable to earn bonus for any length of time (because of low sales), the incentive scheme will fall into disfavour amongst the workers. One of the duties of the Production Manager therefore, is to see that every effort is made to ensure that workers are given an opportunity to earn a bonus while at the same time, he must keep a close check on the size of the warehouse stocks in order to avoid the building up of excess quantities.

From the above, it is submitted, can be seen how important is the relationship between production planning and the incentive wage schemes. The incentive scheme has facilitated production planning and scheduling because it is now known what work can be expected from employees in a certain period of time. This enables production to be

scheduled continually for a period of about ten days in advance, whereas under the rudimentary production planning, prior to the re-organisation of the factory by the efficiency expert, it was highly uncertain as to exactly how long it took to produce certain goods. It is not only the production planning which has been facilitated through the incentive wage scheme, however, but the cost accounting system as well has been improved to provide accurate costs. For example, by placing workers on individual incentives, the exact labour cost is obtained of the packing of boxes of chocolates and all other similar hand operations. In the same way, an accurate labour cost per pound weight of materials produced in any department can be determined.

Possibly an equally important advantage of the bonus system is the information which it has made available. For example, at one time no register was kept of the number of persons employed in each department, or even which particular workers were in which particular department. With the introduction of the incentive scheme, this information became vital for calculating bonuses and, consequently, a register has been kept of the employees in each department. An interesting result of keeping these records is that information is now available to enable a very strict control to be kept over the total number of employees in any one department. At one time, foremen used to be given extra labour whenever they said they needed it, whereas at present the foremen may still request extra labour but only after careful investigation by the Production Manager and the Factory Superintendent, is it decided if the request is warranted and only if it is, is the additional labour authorised. An interesting side-

light is that the workers in any department are not keen on having any extra labour as they realise that extra workers mean higher standards under the group bonus schemes, which as was seen earlier in this chapter, is based on the number of man hours worked per day in the department.

Because the incentive scheme involves the keeping of the records of the work each department or of individual employees, in the case of individual incentives, a natural consequence has been that the Production Manager takes a personal interest in the workers themselves. Through the incentives, good or bad work is brought to his notice, and suitable steps can be taken and reprimands or words of encouragement given. Thus, because of the bonus scheme workers of unusual merit can be given financial recognition far sooner than would be the case if no bonus scheme existed. Similarly the poorer type of worker is soon discovered and steps can be taken, firstly by warning the employee to improve and if this is of no avail, by ultimately dismissing him.

In addition to all the above points, the incentive wage scheme has yielded beneficial results which are dealt with in the concluding chapter. It is notable, however, that the introduction of the scheme has completely revolutionised ideas as regards good and bad workers. Even the foremen of the different departments have been amazed at some of the results which have been accomplished. Workers who had previously been regarded as hardworking have in some cases barely been able to reach the set work standards, other workers who have always been regarded as being inferior, have

earned bonuses of up to 75%, and foremen in certain departments, who had always considered themselves understaffed, found themselves with more staff than they could handle. Even the efficiency expert was astonished at the results obtained, and as many of these benefits were cumulative in effect, it led to even more remarkable results being achieved. It is, submitted that it is quite certain that the introduction of the incentive wage scheme was the most important event in this firm's history as regards the production side of the business.

CHAPTER 9.

SALES.

1) Sales Policy, Planning and Budgeting.

The great improvements in the production side of this factory have tended to overshadow any advances made in connection with sales, but there has nevertheless also been a noticeable improvement in the sales policy of this firm. The first and greatest improvement was the direct result of the introduction of a cost accounting system. Prior to the introduction of a costing system, prices were fixed mainly by reference to competitors' prices. Obviously this was an unsatisfactory state of affairs as it was not appreciated at the time that competitors, in all probability, had a completely different structure of overhead costs and could, therefore, produce certain lines cheaper than this firm and vice versa. Thus the argument that, because competitors could afford to sell at a certain price, therefore so could this firm, was invalid. Because of the reliance placed on competitors' prices, the pricing policy of this firm was completely irrational, as the cost accounting system which was introduced later showed. In the case of many lines, losses were being incurred, whilst in the case of other lines the ability of this firm to meet competitors' prices was hindered as excess profits were being made on these lines. This was financially disadvantageous because either losses were made, or when excess profits were made (fortuitously, of course), the firm did not take advantage

of its lower costs to either meet, or even to cut competitors' prices. It was quite apparent to the efficiency expert employed by this firm for the period of approximately one year, that in addition to instituting a number of production reforms, it was essential that a cost accounting system which could be constantly referred to by the various sales personnel of the factory, be introduced.

A full description of the cost accounting system as introduced by the efficiency expert has been given in the latter half of chapter seven, it is sufficient here to say that the information obtained as a result of this system has, since the latter half of 1954, played an increasingly important role in determining the pricing policy of this firm.

At present, before a new line is placed onto the market, it is first costed to ascertain if it will pay the firm to make the line. The costing gives a clear indication of whether the line can be produced at a reasonable figure, or, if the sample costed does not yield a satisfactory profit, then the costing provides some measure of guidance to the extent to which the weight of the sample of the new line must be altered in order to give a satisfactory return. Once this cost has been finalised, reference is made to competitors' prices, which this firm may or may not find itself able to meet. It should be noted that competitors' prices are used only as a guide, and that it is only in rare cases that a line will not be produced because of the inability of this firm to meet competitors' prices. Matters such as packaging and quality play a very important role in the determination of prices, and therefore it is possible that, if the packing of the article is superior, this firm will be able to

command a higher price for its products than those of its competitors and vice versa. Competitors' prices are most important in connection with the cheaper lines produced, such as liquorice allsorts, which can be obtained from practically any sweet factory in this country. In regard to the more expensive confectionery lines, the position is more flexible, in that assortments are to some extent exclusive to a firm, and quality plays an important role in determining the price which can be obtained for the line.

A very interesting problem is the question of count lines, i.e. lines sold by count for a unit of money such as threepenny, penny and two a penny lines. These lines are generally purchased by, or for, children. The question of price revolves not so much around quality, but around size and value. It is found that, in order to make factory prices attractive to the retailer, manufacturers cut down on the quality of the article they produce, so as to enable them to sell their count lines either at or below competitors' prices. There are generally recognised factory prices to retailers for these count lines, e.g. threepenny lines such as threepenny fruit drop rolls, are sold by the manufacturer for about twenty five shillings and sixpence per gross, giving the retailer a return of one hundred and forty-four times threepence, i.e. thirty-six shillings. As these lines are sold by count, the price the retailer pays for them is extremely important as he knows that his return is fixed, e.g. he cannot sell a generally recognised threepenny line to the public for fourpence. Unlike chocolates sold by weight, where the retailer adds on any mark up he requires, no-one will buy a count line at a higher price than its generally recognised

retail price. Thus, in the determination of the prices at which count lines will be sold, this firm has to keep in line with competitors' prices except where the public demand for certain count lines is so strong, that retailers must stock the line and be prepared to pay a slightly higher price, say twenty-seven shillings per gross for threepenny lines. The importance of these count lines to any confectionery firm cannot be over emphasised because they form the basis of any transactions when doing business with retailers such as the cafe owners, the greatest number of purchasers of this firm's products. Unless the prices of these count lines are reasonable (in relation to competitors' prices), none of these lines will be sold, and what is more important, salesmen will be unable to sell any of the lines sold by weight as most shopkeepers will only purchase these latter lines from manufacturers who supply them with count lines at a reasonable price. This is not an unreasonable attitude as retailers do not make as much profit on count lines as on the other lines, and they feel therefore, that firms which are prepared to accommodate them by giving them count lines at a reasonable price, deserve to be supported in the case of other lines on which they know both the manufacturers, and they earn a larger profit. Thus the prices of this firm's range of count lines is governed very much more by competition than the other lines which are produced. Accordingly, the cost accounting system plays a very small role in the determination of the selling price of these lines. The costing system is of some use though, in that it is able to show what weight per gross the sweets should be standardised so as to be able to be sold at competitive prices and also yield a profit to the firm.

Another very important problem is the question of different prices for different customers. Up till the end of 1954, two sets of prices were generally prevalent in this firm - one to the ordinary retailer and the other to the larger customers of this firm, such as the various bazaars. The latter set of prices was slightly lower than the prices charged to the ordinary retailers. In addition the question of railage allowances was very obscure as in some cases, railage to the customer was paid, whilst in other cases railage was paid by the purchasers of the sweets. At the beginning of 1955, however, a determined effort was made to increase sales by paying railage to all areas. There was also the additional aim of establishing a more definite sales policy. To ensure that at least portion of this extra expense to the firm could be borne, the prices of some of the lines produced were revised in the light of the extra railage costs that would be incurred. This paying of railage in the form of an allowance to customers has directly led to a policy of different prices for different areas, whilst at the same time the distinction between the prices to retailers and the larger concerns is still maintained.

The general attitude of this firm towards discounts is not clearly defined, and much remains to be done in this field. Wholesalers are allowed discounts of $7\frac{1}{2}\%$, and $2\frac{1}{2}\%$ for cash payment within thirty days. Until very recently the cash discount was granted irrespective of whether payment was made within the stipulated time period or not. This has now been stopped and the allowance of the cash discount is more rigidly controlled. In addition to the discount to wholesalers, some retailers also receive $2\frac{1}{2}\%$ cash discount while others receive $1\frac{1}{2}\%$ discount - there being no logical

standards by which to determine whether discount should be allowed or not, nor what percentage should be allowed. In some cases the customers of this firm deduct a cash discount when settling their account without prior consultation with this firm, and this is tolerated owing to the fear of offending the customer and probably losing his business. This position has been brought about because of the intense competition in the sweet industry in this country today. Thus, in actual fact, this firm has no fixed discount policy whatsoever, except for the allowance to wholesalers which is only being strictly controlled now, (from the beginning of 1955), for the first time. These discounts to retailers are not granted on any logical basis and it is hoped that in the future a definite discount policy will be established, and that this will avoid the embarrassment that is sometimes experienced when an important customer accuses the firm of not allowing him a discount, while discounts are allowed to less important customers. Though the present lack of a comprehensive discount policy is not excusable there are innumerable difficulties which will have to be encountered before a firm discount policy can be introduced. The matter of discounts is of vital importance in the establishment of a sales policy, and unless such a system can be definite, it will only lead to a loss of goodwill. Because of this complexity and the fear of offending customers, it is hoped that a proper discount policy when introduced will be firmly but tactfully enforced.

From the above, it can be seen that this firm has now established a pricing policy based on scientifically determined costs of production, and that these prices are applied discriminately between different areas. Under no circumstances can the sales policy of this firm be compared

with the scientific methods applied in the production side of the undertaking, but initial steps have been taken in order to ensure that the future sales policy of this firm will be developed in full conformity with the basic principles of scientific management.

An accurate method of sales planning and budgeting is almost an impossibility because of the wide variations in consumers demand from month to month. The best that this firm can do is to ensure that all the lines it produces are always available in the warehouse. As prices are fixed prior to production, there is obviously no need to compare budgeted prices with actual prices. The introduction and maintenance of a comprehensive budgetary control system would be far too expensive, therefore, the introduction of a sales budget is, at present, impractical.

This does not mean, however, that no sales planning exists but the ideal system (as would be applied to a firm making only a few products) is modified to fit the peculiar characteristics of this firm.

As a direct result of the institution of the new methods of production planning and control, information is now available from the stock record cards as to what lines sell well, and at what times of the year these lines are particularly demanded. This provides salesmen with valuable information as to what lines should receive intensified sales effort and at what periods. This information also enables lines which only sell very poorly to be withdrawn so that salesmen can better employ their efforts on those lines which have a better prospect of being sold.

Quite naturally the ideal in this firm, like that in any other firm, is to sell as much as is possible, but as yet no budgetary sales target has been set. It is of interest to note, however, that a scheme is being planned by which the sales of the various sales representatives of this firm will be analysed, and a target sales figure set for each representative. It is also hoped to introduce some sort of incentive selling scheme in conjunction with the target sales figures, in order to give salesmen financial encouragement to surpass the set targets. If this scheme comes into operation, it will lead to the establishment of a total sales target figure, and at the end of the financial year, this target figure will be compared with the actual total sales. Further, it will then be possible to analyse the sales in different areas by different salesmen, and will provide information for a detailed investigation to be made where sales have not been considered satisfactory. This in turn will make possible the reallocation of sales promotional expenditure in favour of the areas where sales have not been satisfactory. The introduction of a system such as that described above means a considerable amount of analytical work being undertaken and extra administrative staff may have to be employed, but the usefulness of any data obtained would justify the extra expense.

Expenses incurred in promoting sales, such as the costs of advertising and costs of samples, are only loosely controlled, though in the former case the extremely conservative advertising policy of this firm ensures that advertising expenditure is kept at a minimum. The costs of advertising has been budgeted for in an indirect way by estimating an

allowance of two thousand pounds per annum, and including this figure in the list of administrative and selling expenses and including these costs in the administrative and selling costs percentage which is added on to all costings made by the Production Manager. This estimated figure is also relied on by the Directors as a guide to the amount of money to be spent on sales promotional media, though the actual advertising expenses usually amount to a lesser figure.

From the above it can be observed that, though the sales policy of this firm leaves a great deal to be desired - particularly in regard to control measures, there are very strong prospects that the sales system will be improved in the comparatively near future, so bringing the sales organisation to the same level of efficiency as at present exists on the production side of this firms' activities. Indeed, in some cases, the technical progress made in the production methods of this firm automatically ensures that sales methods also improve. A typical example of this is the case cited above as regards the role the stock record cards play in assisting sales executives with information. The importance of an organised and scientific sales policy cannot be over-emphasised as it is in the field of sales that the whole future of this firm lies. The production potential of this factory is able to cope with any extra sales and only when maximum output is produced, can the fullest advantages be reaped from the incentive wage schemes and production control schemes - and this output can, and will, only be produced if the sales of this firm can keep pace with production - something that is not the case at present. Until such time, only partial benefits can be expected from the scientific

management applied to the production side of this undertaking.

2) Co-ordination between Sales and Production.

Once the new systems of scientific management applicable to the production side of this firm's activities became established, and yielded beneficial results, a very serious consequence arose - viz. sales had to be expanded to avoid the piling up of stocks of finished goods in the warehouse. During 1954 no difficulty was experienced, as the incentive and production control schemes were only introduced about half way through the year when sales were already beginning to expand in anticipation of the usual Christmas boom period. Even at that time, however, it was realised that with the coming of the New Year (i.e. 1955), the production potential would far exceed the possible sales of sweets, which in turn would mean that the firm would have to produce below maximum capacity. Hence the incentive and production control schemes would not be yielding the greatest possible advantages. There are two ways in which benefits can be derived from an incentive scheme:-

- a) The reduction of the labour force while the same quantity of production is still obtained as prior to the advent of the wage incentives.
- b) Reduction of the labour force only slightly, while production expands.

In the former case, a firm would still be producing below full capacity, and the only savings effected would be the wages of the number of workers who have become redundant

as a result of the introduction of the incentive wage scheme. In the latter case, however, though a smaller amount is saved in the form of wages, maximum benefits are obtained, as the firm is producing at full capacity, and thus, very substantial reductions are effected on unit costs because the overhead burden for the firm, (which is relatively constant irrespective of production), is spread over a greater volume of production. In addition the extra weight of goods produced should mean extra profits assuming that all production is sold and that all other things remain equal.

This then is the problem that confronts this firm: during the last three months of any year, the position is satisfactory because all production is sold owing to the increasing demand arising from the advent of the annual Christmas trade. The period June to September is fairly satisfactory in that production potential only exceeds sales (in terms of weight) by about 20%. During the first six months of the year, however, the production potential far exceeds sales - probably by about 35% (once again in terms of weight). This position leads to only small savings being derived from the incentive scheme during the first half of any year, but these savings increase as the factory becomes progressively busier towards the Christmas period. All senior factory executives have been made aware of this position and many new ideas have been advanced, and in some cases put into practice, in an effort to increase sales, particularly during the first six months of any year. The aim is not merely to expand the markets for this firm's products but also, to maximise any possible savings resulting from production being maintained at a high level. For

example, travellers have been instructed to intensify their efforts in selling such lines as "Liquorice Allsorts" which can easily be produced in bulk, thus leading to very large economies - if two batches of this commodity can be produced weekly instead of the normal single batch, a saving in cost of one penny per pound can be effected. It should be noted, however, that goods will not be ordered merely to stand in the warehouse and deteriorate just for the purpose of keeping factory production at a maximum level - if there is sufficient stock in the warehouse to cater for all sales needs for a period of ten days to two weeks, the line will not be re-ordered till the level of the stocks falls below the minimum stipulated on the stock record cards.

An extremely important connection between the production and sales departments of this firm is in regard to the introduction of new lines. At one time, these lines were made either without the knowledge of anyone in the sales department, or, more usually, travellers were instructed to sell the line before adequate stocks had been built up in the warehouse, the result being that many customers willing to purchase the new line did not have their order completed. Needless to say this led to a certain amount of friction between the sales and production personnel of the factory, and in addition, gave rise to annoyance on the part of customers. As a result of these experiences, the procedure now adopted is that the Production Manager informs the Sales Manager and the Assistant Sales Manager when new lines are to be produced, and requests the latter not to release the line for sale until adequate stocks have been manufactured. Once the Production Manager considers that a sufficient stock of the

line has been built up, he informs the Assistant Sales Manager of the fact, who in turn circularises all sales representatives that a new line has been introduced and that they may commence selling it. In cases where this system has been followed, it has been found to work perfectly and all the earlier difficulties have been eliminated.

Owing to the extremely competitive nature of the sweet industry, the introduction of new lines plays a very important role in the field of sales. The reason for this is that most shopkeepers are prepared to give a new line a trial - further orders being dependent upon public demand for the line. The initial orders, however, amount to a considerable amount of money, and there is always the possibility that the line will develop into a best seller. Because of this, the production executives of the firm have a responsibility to all sales personnel to carry on research into the possibilities of introducing such new lines. Similarly the sales personnel have a responsibility to inform the production executives of the factory of any recent developments in the sales side of the sweet industry, such as the introduction of new types of confectionery by competitors, and any possible new methods of packaging. Once a new line has been evolved by any one of the factory executives, it is usually brought forward for discussion at periodic joint meetings of sales and production personnel, and here it is decided whether the line should be manufactured or not. At these meetings, consisting of the Directors, the Production Manager, the Sales Manager, Factory Superintendent, the Secretary, the Chemist and the Assistant Sales Manager, the prospects of the line are discussed in the light of any production

difficulties which may arise and how these difficulties might be overcome. In some instances where a formal meeting is not held and the line is accepted for production by a series of informal discussions among the various factory executives, then it is the duty of the Production Manager to notify the Sales and Assistant Sales Managers, if the latter are not aware that it is proposed to put a new line into production.

The main purpose of the meetings described in the previous paragraph, however, is not so much to deal with new lines, as there is in any case the alternative procedure of the Production Manager informing all sales executives, but more specifically to discuss questions such as packaging of confectionery, to deal with complaints of customers and discussions on general factory policy. For example, if a complaint is to be investigated, the sales personnel will inform the meeting whether the complaint is widespread and must be dealt with seriously, or whether it is merely an isolated instance, and as such does not merit a detailed investigation. Similarly, the production personnel will have the opportunity of advancing reasons for the complaints and after a general discussion on the complaints, these may either be accepted or rejected. The importance of these meetings (usually held about once every six weeks) cannot be over-emphasised as it is here that matters can be discussed without any aspect being overlooked. The attendance of the Chemist at the meeting ensures that any decisions taken, for example, in connection with the introduction of new colourings, will be technically practical. He will advance information on such matters as the effect of humidity, flavouring and colouring, and the ultimate decisions are made in the light of this information as well as the points put forward by all other factory executives.

The methods of co-operation as described above have worked exceedingly well and have resulted in the elimination of problems such as the sales personnel condemning sweet wrappers as being too dull and unattractive and having very little sales appeal. Similarly the fact that the sales staff have been instructed to inform production personnel of any recent developments in competitors' lines, ensures that the production departments of this firm will maintain a rate of progress and development such as to enable this firm's sales representatives to be equipped with a full range of competitive lines.

3) General Matters Relating to Sales.

The sales personnel of this firm are organised to ensure union wide representation. In addition to resident salesmen who are employed by this firm for local sales, full time representatives are employed to cover the whole of the country with the exception of those areas in which it is uneconomical to employ a representative. To avoid over-centralisation and to facilitate delivery of goods, two depôts have been established. Each dépôt is under the control of a Dépôt Manager who controls the country representatives operating in the territory served by the dépôt. For example, the whole of the sales force in Natal is under the supervision of the Durban Dépôt Manager. In addition to the depôts, full time resident salesmen are employed to sell the firm's products in towns such as Bloemfontein and Johannesburg.

This firm has always pursued a very conservative sales policy, particularly in regard to advertising. Until the middle of 1954, the Directors of this firm had adamantly refused to spend money on sales promotional media with the exception of small sums on advertisements in a few technical journals. It was hoped that these advertisements would attract foreign customers. The result of this conservative advertising policy has been that though this firm receives many orders from retailers in the town in which it is situated, it has not the same predominance in its local market, that other confectionery firms have in the towns in which they are situated. Naturally the position is even more serious in the country areas where selling effort obviously cannot be as intense as in the town in which this firm is situated.

As competition became more and more intense, it became imperative that this firm should indulge in some form of sales promotional activity in order to maintain its position in the national confectionery market. In September 1954, it was decided to advertise more intensively. The first medium chosen was the film slide and this was employed in Johannesburg, Cape Town, Durban and Port Elizabeth. Shortly after this, it was decided also to utilise poster advertising in the form of painted displays on the sides of buses. At the time of writing this Thesis, this is as far as the matter has been taken, but it is evident that these preliminary steps will have to be augmented by such media as the radio, or by screen advertising in the form of filmlets, if maximum benefits are to be obtained. Unfortunately the advertising policy of this firm is not under the control of any one

person, but is controlled by all of the factory executives - with the Directors giving the final approval. This has often led to a stalemate, as frequently no agreement is reached on what media should be chosen and, consequently, many matters are left permanently in abeyance. The question of conservatism also arises as the Directors of this firm are still not entirely convinced of the desirability of spending large sums of money on advertising. Until such time as a reasonable sum of money is allocated definitely for sales promotional activity, and this is placed under the control of one of the factory executives (who would thereby assume the role of Advertising Manager), the advertising carried out by this firm cannot be expected to yield the maximum benefits that could be obtained.

A further result of the intense competition experienced in the sweet industry is that this firm is paying more and more attention to the all important question of packaging. It has been realised that, initially the public are attracted towards a new line by advertising, and once the lines are displayed in the retail shops, by the packaging. As this firm cannot rely on its present advertising to attract the attention of the public to any marked extent towards any new line introduced for sale, (owing to the comparatively small use made of advertising media), the question of packaging becomes increasingly important. It costs very little extra to package goods attractively and research is being carried out on behalf of this firm by various lithography firms into matters such as the printing of attractive price tickets, cartons and boxes. Similar efforts are being made to improve the sales appeal value of wrapping papers and all other similar matters so important in the presentation of a product.

The importance of the above mentioned points in relation to sales cannot be sufficiently stressed as the whole future of this firm is dependent upon the development of sales. The production potential of this firm has been increased greatly, and in order to derive the greatest savings, it is necessary to operate at, or as near as possible to, full production capacity, which means that it is imperative that the sales of the firm be expanded. This involves a far greater use of advertising media than has hitherto been the case. The sales organisation of this firm has been neglected for too long - an efficiency expert has been employed to remedy the faulty production organisation and to institute sound and scientific methods of production planning and control - and now an experienced sales consultant must be employed to re-organise the sales side of the firm. Until such time matters will tend to remain relatively static with sales (and hence production) only reaching maximum levels during the latter months of the year.

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P A R T 3.

C O N C L U S I O N .

CHAPTER 10.

1) Results of the Scientific Management as Applied to this firm.

The incentive wage scheme was introduced during the months of June and July 1954 and, as can be seen from diagram 13, factory production immediately benefitted. For example in July 1953, the average production per week was one hundred and fifty-five thousand pounds weight, while in 1954 for a similar period, the average production per five day week amounted to one hundred and seventy-eight thousand pounds weight. The records of this firm also reveal that the labour force of the factory dropped from four hundred and ninety workers in July 1953, to four hundred and fifty workers in July 1954. Despite these very good results, the efficiency expert maintained that even greater benefits would be experienced once the annual Christmas rush period began because the factory would be working at almost full capacity. It will be noticed from diagram 13 that in September 1954, production actually dropped below that of the previous two months, not because the factory could not produce any more, but because sales for that month decreased below the previous two months figures, and as a consequence, production in the factory was reduced so as to avoid the building up of surplus stocks. This is a very real danger when it is realised that sweets deteriorate rapidly in storage. Despite the comparatively low production in September, the level of production in October increased almost to a figure of just below two hundred thousand pounds weight per week, almost a record. Orders from customers increased greatly,

and the firm with its new production regime was able to meet all these seasonal orders.

The planning, control and incentive wage schemes all combined to yield maximum results, and though production increased so considerably above the previous year's level, it was noteworthy that for the first time no extra labour was employed to cope with the seasonal rush⁵. A similar position existed during the month of November, and the high production figure of October was surpassed. During these two months, the factory was producing at full capacity and departmental bonuses of up to 75% of total wages (inclusive of the cost of living allowance) was being earned by many of the employees. By December the greatest part of the rush season was over and production was actually below the 1953 figure. It is of great interest to examine this position thoroughly and to put the matter in its true perspective, so as not to underestimate the production of December 1954.

Firstly, it should be noted that the absolute production of the various months cannot be compared as some months have twenty three working days, whilst other months may have had only eighteen or nineteen working days. To overcome this problem, the monthly production is reduced to a rate of production per five day week, by multiplying the

5. Prior to 1954 it was the usual practice to employ about forty to fifty extratemporary workers (consisting to a very large extent of schoolchildren who were on holiday at the time) in order to cope with the annual Christmas trade. This practice was discontinued in 1954 as the incentive wage scheme enabled production to meet the heavy demands made on it by the heavy annual Christmas sales.

total monthly production by five, (the number of working days in a full week), and dividing by the actual number of working days in the month. This production figure per five day week is then comparable with a similar figure obtained for any other month. Now, owing to the extremely high production in October and November, it was found possible to devote some of the working days in December to cleaning up the factory, as all orders from customers had been dealt with. In previous years this had not been possible as production had been unable to cope with the heavy Christmas demand for this firm's products. Indeed, prior to 1954, it was not uncommon to have several departments returning to work after the factory had officially closed in order to clean up. Thus, during December 1954, included among the working days for the month were three days actually spent in cleaning and general maintenance work. Obviously this had an adverse effect on the weekly rate of production calculated as above.

Secondly, as from the end of November 1954, it was decided by the factory executives not to replace employees who left the firm, as it was an established fact that with the beginning of the New Year, only a minimum of workers would be required, because of the lack of orders from customers. As a result, the labour force at the end of December numbered four hundred and thirty-five employees as compared to the average of about four hundred and seventy in previous years. Taking account of this reduced labour force, and the fact that three working days were spent on cleaning up the factory, it can be deduced that the December weekly production figure in actual fact was very much higher than is shown on the graph.

MONTH

Z O U C 4 4 3 O 3 T

MONTHLY AVERAGE PRODUCTION IN 10,000 LBS

COMPARISON OF PRODUCTION 1953 - 1954

1953
1954

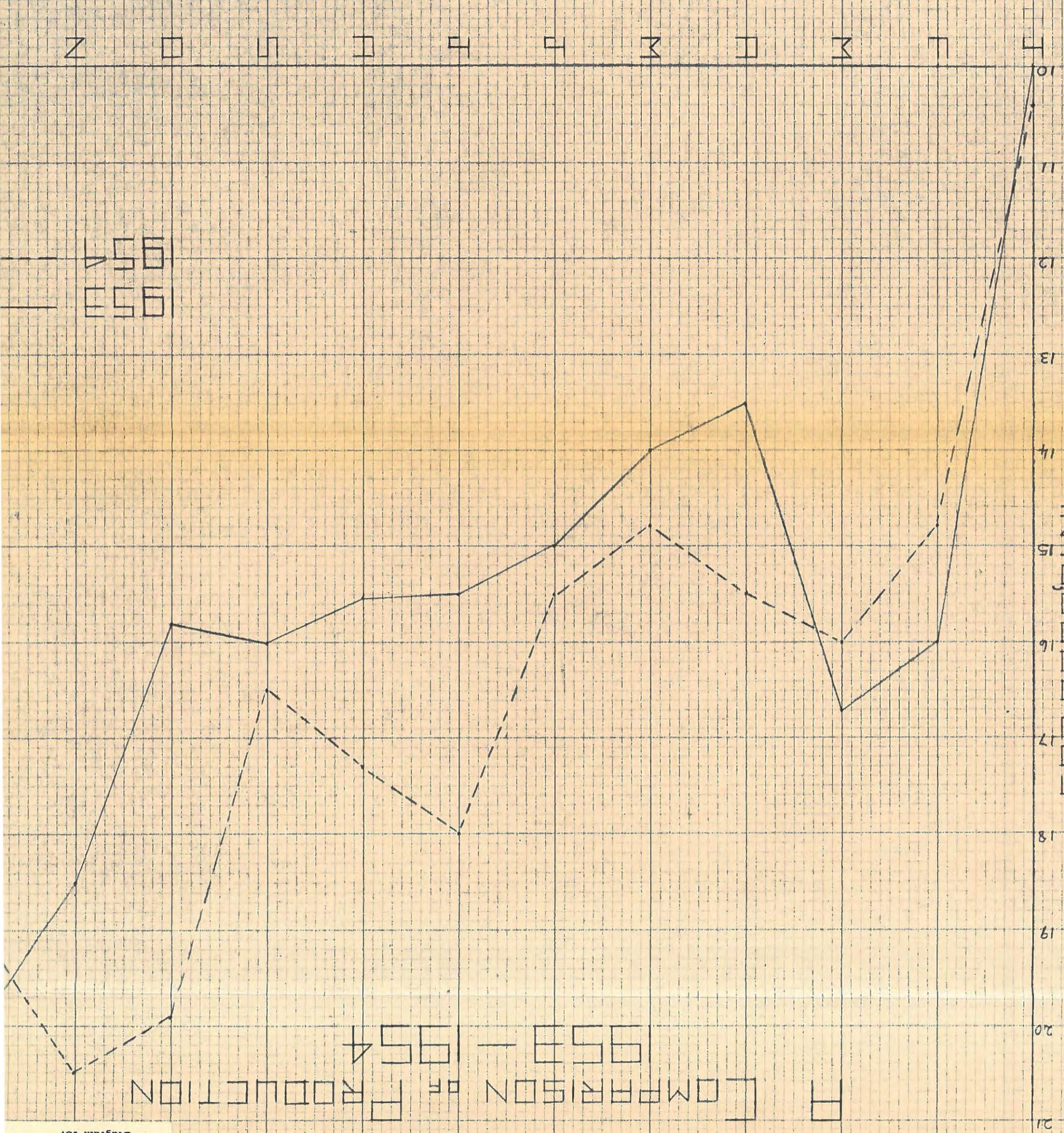


Diagram 13.

The financial benefits that are obtained from the incentive wage scheme can be divided into two general classes:

- 1) Savings in connection with overhead costs.
- 2) Savings in wages due to a reduction in the labour force.

In the former case great savings were effected because the overheads of the factory, which remain comparatively constant, were now distributed over a much larger production. In the latter case, i.e. saving in wages, there were less workers employed than in previous years - hence less wages paid per unit of output than in previous years. In addition, because less workers were employed the firm was able to effect savings in that there were less employees to receive holiday pay, and less contributions for the firm to make towards sick and provident funds. Unfortunately the exact financial benefits cannot be determined as all wages were increased during 1954 and thus, it is difficult to compare the wage bill of this firm prior to the introduction of incentives and the wage bill after the incentive scheme had been established. It is submitted, however, that it is quite certain that the savings which were effected under the incentive wage scheme must have been substantial (see the Production Manager's report on the advantages of the incentive wage scheme in chapter 8).

The following table provides information from which the extent of the financial benefits of the incentive wage scheme can be deduced. The following off-

setting factors, however, should be taken into account:-

- 1) The wages for October 1954, in addition to including the amount of bonus wages paid during that month, also includes a general wage increase which had been given to all workers after October 1953.
- 2) The manufacturing overheads for October 1954, are over one thousand pounds more than October 1953, e.g. the cost of electric power to the firm had been increased by about four hundred pounds per month, due to an increase in the power tariff during October 1954.
- 3) The maintenance expenses during October 1954 were about three hundred pounds above the normal monthly figure. The main reason for this was that an engineer was for the first time, employed by the firm during this month, to take charge of the maintenance department.

If these offsetting factors are taken into account, the financial benefits as illustrated below, would definitely be greater, particularly so in the case of the gain from spreading the overhead rate over a very much greater production.

TABLE 8.

Comparison of Figures of October 1953 with that of October 1954.

| <u>Date.</u> | <u>October 1953.</u> | <u>October 1954</u> |
|--------------------------|--------------------------|--------------------------|
| Production | 696,360 lbs. | 785,389 lbs. |
| Manufacturing Overheads. | £9,559 i.e. 3.29d/lb? | £10,708 i.e. 3.27d/lb |
| Manufacturing Wages. | £8,090 i.e. 2.78d lb. | £7,980 i.e. 2.43d lb. |

The reason for choosing the month of October for deducing the influence of incentive wages, is because during this month in 1954, the factory was working to almost full capacity, and therefore this month would illustrate most fully the benefits derived from the incentive wage scheme. During November 1954, the firm was already allowing the labour force to drop naturally as a result of labour turnover, and thus the month of October was a better choice than November.

From Table 8 it can be found that:-

- 1) The labour cost per pound weight of production in October 1953 was 2.78d per pound weight.
- 2) The labour cost per pound weight of production in October 1954 was 2.43d per pound, i.e. 0.35d per pound less than the previous October.
- 3) The overhead cost per pound weight in October 1953 was 3.29d per pound weight of production.
- 4) The overhead cost per pound weight of production was 3.27d per pound weight of production, i.e. 0.02d per pound less than the previous October.
- 5) The financial benefit thus derived from the incentive wage scheme⁶ amounted to 0.37d per pound weight of production (0.35d on the labour cost per pound, and 0.02d on the overhead cost per pound). Therefore, the financial savings in October 1954 as compared to October 1953, amounted to 0.37d on every pound weight of production, i.e.
785,389 x 0.37d £1,210.

6. Although the benefits as described above are stated to be derived from the incentive wage scheme, the importance of the production planning and control schemes must not be ignored, as these latter schemes also had a favourable effect on production, e.g. the elimination of rush orders; though admittedly their effect on production was not as marked or as direct as that of the incentive wage scheme.

From the above it can be noted that when talking of savings in wages resulting from the incentive wage scheme, it is not the absolute level of wages that must be thought of, but the cost of wages per pound weight of production. For example the absolute level of wages in October 1953 and 1954 were almost the same, it is the labour cost per pound weight of production which is different.

The large increase in production resulting from the planning and incentive wage schemes introduced by the efficiency expert, though being of extreme importance and benefit to this firm, were a means to the end - as all production must be - of making it possible to keep pace with increased sales. The following points illustrate how the scientific production methods (including the incentive wage scheme) assisted in keeping pace with increased demands from the sales department.

- a) Even during the Christmas rush period, production was easily able to keep pace with increased sales, thus "follow on" orders were minimised and this in turn led to greater goodwill between this firm and its customers.
- b) In previous years sales had been reduced because, during the busy periods of the year, the factory had always been unable to cope with the demand, and hence many orders from customers remained unfulfilled. During the same period in 1954, however, this problem did not arise as production over the three months of October, November and December was greater than for any other year.
- c) The fact that the incentive wage scheme involves a system of penalisation for faulty work (i.e. faulty work has to be redone), leads to an increase in the quality of the work produced. Because of this factory less complaints were received from customers as regards work of poor

quality, and thus once again, the goodwill between firm and customer was enhanced.

- d) An incidental result of the scientific production methods introduced into the firm was that a considerable amount of information (such as that contained in the stock records cards) which became available for the purposes of sales analysis.
- e) The introduction of the costing system provided, for the first time, information which was of real importance in pricing policy. This system in addition to providing information on the costs of all the lines made by this firm, also provided information such as what lines could be produced economically, and the degree of profitability of the various lines produced.
- f) Because of the planning system the Production Manager could inform sales personnel when goods, temporarily out of stock, would be completed and ready for issue to the warehouse. The sales personnel could then inform their customers when the delivery of these lines could be expected.
- g) Finally, the costing system has helped to expand sales of certain lines as it was found that certain lines had selling prices far in excess of their costs and these selling prices were reduced so as to give increased turnover.

Obviously the benefits of the scientific management as described in this Thesis have not only been confined to the sales side of the business, but to all other fields of business activity as well. The most important results of a general nature are:-

- 1) Production during 1954 was not as subject to violent fluctuations as was previously the case. The fact that a smaller staff was employed enabled bonuses to be earned by the employees throughout the year.

As a result of this, production varied between a high level for the number of workers employed, and a very high level whereas previously employees were either laid off or extra workers were taken on in order to cope with the fluctuating demand. Thus, at present production is stabilised at a higher level than previously, and does not fluctuate to nearly the same extent.

- 2) An important result of the incentive scheme was that employees took a greater interest in their work, and adapted to their work, methods which would yield the greatest output. An important incidental effect was that, through the initiative on the part of workers, many work methods were improved and standardised.
- 3) Once employees had been put on incentive wages, the task of supervision by the departmental foremen was greatly simplified. The reason for this was that workers were able to appreciate that delays in their work, such as frequent excursions to the cloakrooms or idle chatter, would mean a loss of wages. This has enabled the factory foremen to concentrate on the many technical matters which are their responsibility to a far greater extent than had been the case prior to the introduction of incentives. The importance of this is borne out when it is realised that in cases where group bonus schemes are in operation, incidents have occurred where employees have been reprimanded by their fellow workers for idleness when they should have been working. Workers are now constantly on the look out for more work once they have completed their allocated tasks, whereas previously just the reverse was the case.
- 4) The fact that work flows swiftly through the factory means that the length of time before the sweets arrive in the air conditioned warehouse is shortened; therefore the risk of deterioration is reduced. This matter is extremely important as the entire factory, with the exception of the warehouse, is not air conditioned.

- 5) An intricate part of the production procedure at present involves the maintenance of production records, such as the keeping of an attendance register of all employees and the daily output of each department. All of this information provides data which can be adapted for control measures, such as the limitation of staff in any department or in the factory as a whole, or the keeping of a check on departmental weekly production and the investigation into any deviations from the normal. The importance of these control measures can well be appreciated when it is realised that, prior to the advent of the systems introduced by the efficiency expert, it was often found that new staff were taken on because the Factory Manager thought extra workers were needed, whereas in practice there was an excess of workers employed. This position came about because no check was kept on the rate of absenteeism. Under the present system, a strict control is kept over the number of workers employed, and workers who are continually absent from work are first warned and ultimately dismissed if the offences are repeated. The compilation of all these records has been essential in order to maintain the production planning and incentive wage schemes and, though these records are only an incidental result of the work of the efficiency expert, they served an extremely useful purpose.
- 6) One of the most important results of the incentive wage scheme, and one that tends to be frequently overlooked, is the very marked increase in goodwill that has arisen between the management of this firm on the one hand, and the trade union and employees on the other. The importance of the above point cannot be over emphasised when it is realised that incentive schemes can so easily give rise to industrial unrest. It is submitted that the main reasons for this goodwill between employers and employees in this firm are:-
- a) The Production Manager to a large extent controls the bonuses that can be earned by each department, as he controls the production that is to be carried out. For example, when he does the planning, not only does he have to bear in

mind the smooth functioning of the production organisation, but also what bonuses are likely to be earned, and how by scheduling, the bonuses can be maintained at a stable level. Quite naturally scheduling plays a major part in many instances in determining whether bonuses will be earned or not. The reason for this is that work can be scheduled for a definite production week, thus to a large extent determining the output, and hence the bonus, for that week. The aim of the Production Manager in regard to bonuses is that it is preferable to earn a smaller bonus each week, rather than to allow a big bonus to be earned one week, and no bonus the following week. As far as possible the planning is carried out with this aim in mind, as well as attempting to minimise the number of lines out of stock in the warehouse. For example if a certain mixture (for which, let it be assumed, there is no immediate hurry) were to be ordered, the Production Manager might possibly hold the mixture over for a production week in which there was very little work for the department, rather than ordering it immediately, possibly in a week in which the employees of the department would in any case have no difficulty in earning bonus wages.

- b) The fact that the planning, and more particularly the incentive scheme, has resulted in a smaller labour force being employed, ensures that the paying off of workers, or the working of short time (during slack periods) is reduced to a minimum.
- c) Even in those cases where short time is worked - the fact that workers are paid incentive wages gives them an opportunity to earn extra pay and make up for the short time worked, i.e. workers may be able to earn sufficient bonus over the four working days of the week, to make up for the one day that they worked short time. The question of

short time is not of marked importance in regard to the workers who are not on incentive, as this class of workers is made up of only a very small minority of the manufacturing staff of this factory. In any case the question of short time as a general rule does not effect these employees as they are largely made up of native labourers, who are employed to clean the factory and consequently, have to come in to work even though a department may be working short time.

- d) A greater interest is being taken by the employers in the work of their employees as the incentive scheme entails the recording of the different employees' output. This lessens the tendency to look upon employees as production units rather than as individuals. This new approach is particularly the case in regard to workers on individual incentives, where an investigation into why workers are unable to reach standard output has shown that in many cases the poor work is a result of difficulties either in the home life of the employee, or some other such similar reason. The psychological effect of this interest in the employees is extremely important, as they feel flattered that management is taking an interest in what they are doing. Often a friendly word of advice and encouragement has been all that the employee has needed, and consequently, the Production Manager at times has had to adopt the role of a personnel officer.

In the light of the matters dealt with above, it is submitted that the incentive scheme as it is operating at present augurs well for the future. Indeed as some proof of the goodwill that exists between employer and employee, it is a noteworthy fact that in the year of the operation of the scheme, not one dispute has arisen.

As long as this feeling of goodwill is maintained, the possibility of the incentive scheme being abandoned is remote. Difficulties will naturally arise, but provided they are dealt with in a fair manner and with the co-operation of all parties concerned, they should not give rise to any unrest.

2) The Future of Scientific Management in this Firm.

From the results as described earlier in this chapter it will be observed that the system of scientific management as introduced into this firm, (i.e. the production planning and control, costing and incentive wage schemes) has yielded very substantial benefits, particularly the incentive wage scheme. All these benefits, though confined largely to production, have assisted the sales of the business (see chapter 9), and ultimately, the profits of the firm. Despite the fact that maximum benefits cannot be obtained throughout the entire year because the factory cannot produce at maximum capacity as the quantity it can sell is limited, this system of scientific management may be expected to yield great benefits (particularly those of a financial nature) once the sales of the firm can be increased to, and maintained at the highest possible level.

This scientific system has now been accepted by all the factory executives largely because it has proved that production can be maintained at a higher level than previously, while the labour force is smaller. The planning and control schemes have worked extremely satis-

factorily, and no difficulties have been experienced (other than those when the schemes were introduced). It is with the incentive wage scheme, if anything, that difficulties may occur. Because the incentive scheme involves a direct payment of money by the employers, and a direct receipt of money by the employees, there is always the danger that one or other of the parties may become dissatisfied because either:-

1. Employers might believe they are paying out too much money in the form of bonuses;
2. Employees might believe that they are receiving insufficient bonus payment for the work they have performed;

These are very real dangers as the employers always tend to calculate the bonus paid in absolute sums of money without reference to factory production - thus the frequent complaint by the Directors of the firm is, "Where is the money which we are saving because of the incentive scheme?" Regarding the employees the position is also one that might lead to dissatisfaction because of the very nature of the incentive scheme, i.e. the payment of extra wages conditional on extra production. Because of this position, the Production Manager has to treat both the Directors and the employees of this firm very tactfully. That this policy has been successful is borne out by the fact that the workings of the incentive scheme have been remarkably free from any form of conflict and that even the Directors of the firm, though still maintaining some doubts as to the financial benefits possible, have readily admitted the benefits described in the earlier part of this concluding chapter.

That this firm is capable of earning large profits was illustrated during the period 1942 - 1950 (see diagram 1). Since then, however, competition has intensified, and costs of raw materials have increased out of all proportion to the increase in prices of manufactured confectionery. In order to attain the same large profits as during the latter years of World War 11, and the immediate post war years, much remains to be done. Production methods in this firm have been beneficially re-organised, and it is hoped to establish a sound sales organisation run in a scientific manner. Once this ideal of a sound sales organisation has been realised, large profits will again be earned. Until then, however - uphill - against the wind - all the way.
