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PROCEEDINGS

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COSTING FOR THE TEXTILE INDUSTRY

By H. M. BROADLEY*

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FOREWORD

The system of Textile Costing which is described in this paper, is based on " Standard Costing," or the determination of the cost of standard products, produced in standard quantities under standard conditions, which may be normal or otherwise.

During recent years the British textile industry has been subjected to statutory price control and prescribed process rates which has had the effect of unification of particular prices for each section of the Industry. The introduction of these price control orders has made textile executives more cost minded than has been the case in the past, and there is now apparent a general desire to know more about the science of actual cost finding as a means of comparing accurate individual mill costs with market or statutory prices.

Costs form the foundation for building comparative statistical data that would prove of real value to the Textile Industry, particularly as an accurate guide to uniform price fixing provided of course that uniform methods of arriving at costs are first introduced, and efficiency achieved.

Economics of industry must be applied now in order that we may expand in the future and compete in world's markets at a world's price.

Costing is based on three main items which are common to all industries, and may be briefly defined as Wages, Materials, and Overhead Charges.

The next stage in costing deals with the proper apportionment of these three items of expenditure, comprising the collection of costs for every order, job, service or unit, so that correct data may be available for the efficient control of the respective undertakings.

The co-operation of all concerned with production is required in order to reap the maximum benefits arising from modern costing. Co-operation of necessity requires knowledge of all relevant detail. Managers, assistants, and foremen should be made aware of their costs, encouraged to make suggestions, and to inaugurate more efficient and economical production methods.

* Mr. H. M. Broadley, F.C.W.A., is the cost accountant at Messrs. Richard Haworth & Co. Ltd., Salford.

Scientific progress in the textile industry can only express itself as a practical aid to the industry through the voice and terminology of cost accounting. The enthusiastic textile technologists, together with the textile engineers need the guidance of the acid test of cost accountancy, otherwise it is not known if new schemes are good or bad.

The Budget examples and Cost Tables which are included in this paper refer to a spinning and manufacturing company equipped with the following machinery, which is listed in Table II :

Carding Engines	200
Drawing Frames	14 Preparations.
Cardroom Speed Frames	As listed
Ring Spinning	100,000 Spindles
Weaving	1,000 Looms.

The Objects and Problems of Installing a Cost System

What are the objects and problems of installing an exact cost system at your particular mills ? These may be briefly defined as follows :—

Objects :

(1) To measure progress and indicate the most economic productions.
(2) To indicate the efficiency of machine and process output at every stage.
(3) To provide the management with an indication of the progress of work in process, and reveal by resultant statistics the source of abnormal waste, inefficiency and leakage.
(4) To indicate where future savings or cost reductions may be made by the use of weekly charts of cost and output values, expressed in terms of standard wages and expenses, which is a unit measure of process efficiency expressed in sterling.
(5) To establish correct costs at each Mill, so that comparison of costs with other units within the same group may be made.

The Problems of installing a cost system are briefly :—

(1) The accurate allocation of all overhead charges, direct and indirect wages to each process. It is essential that the total cost for both wages and expenses be ascertained for each process, whether such process is productive or merely changing the form of package.
(2) Defining the departmental functions or process groups, giving a clear definition of each, and the setting up of output target figures.
(3) Preparation of uniform schedules of headings for the analysis of expenditure, and a description of what is to be included under each expense heading.
(4) Instituting systems of weekly returns which are necessary to compare actual production with the target calculated for each unit.
(5) The need for some practical industrial training on the part of the accountant responsible for installing the system.
(6) The linking up by budgetary control the cost accounts with the final trading accounts.

All costs must be segregated, and the following method is recommended :—

Purchases Inwards for Entry in Loose Leaf Analysis Books

(1) Direct Material Costs. This refers to raw materials for use in subsequent process, e.g., raw cotton, yarn, rayon, material chargeable to a particular job.
(2) Prime Costs. Size material, healds, reeds.
(3) Factory Expenses. Power, rents, rates, insurance, departmental repairs and consumable stores analysed in a uniform order as determined by uniform definition.
4) Sales, Administration and Transport. This is self explanatory and refers to the expenses of sales, publicity and administration.

Each of these trading accounts must be broken down to disclose at a glance *the purchase totals of each separate item of expense included in the Budget.* Analysis accounts might be printed on wide columnar sheets with the headings of uniform trading accounts entered at the top. The analysis books should be ruled off and balanced monthly, and stock values recorded.

The Gross Payroll must be analysed weekly to each process

(1) *Direct Wages.* Wages incurred in the actual conversion process. These are generally piece-rate workers, e.g., cotton weavers, cardroom operatives, spinners, etc. Direct workers include those paid datal or hourly rate, plus production piece rate or any other combination of incentive rates.

(2) *Indirect Wages.* This refers to wages paid to ancillary workers who are not directly handling the process production, but are essential to the efficient working of process employees. For example, cleaners, oilers, sweepers, truckers, supervisors, hoistmen, bobbin carriers, weft men, etc.

(3) *National Insurance.* The employers weekly contribution must be allocated to each process.

Sales must also be analysed to provide suitable statistics, including details of credits for waste, scrap metal, cloth fents, etc.

It will be an advantage if the quantities in lbs. or pieces, etc., are included in the various analysis accounts in addition to sterling values.

The nominal ledger should be in the same progressive sequence as the purchase and sales analysis books, and the same sequence carried forward to the budget. This scheme simplifies the systematic posting of ledgers in practice.

The Cost Budget (Table I)

The budget of overhead expenses for any year under review is extracted, partly from Average Trading Account figures as disclosed by the Nominal Ledger, and partly from actual adjustment based on present-day knowledge of the trend of prices or costs.

The active machine hours must be carefully noted for each process each year, and stores adjustments made for any idle plant.

The cost budget is headed, and sub-divided to the following cost accounts.

Ref. 1.	Spinning and Weaving.	Process cost accounts for transfer to Table II.
Ref. 2.	Power Account	
Ref. 3.	Maintenance	
Ref 4	Transport	... For final inclusion in final costs schedule at a flat rate per lb.
Ref. 5.	Sales & Administration	... For inclusion in final costs schedule as a percentage of overhead rate.
Ref. 6.	Direct Charges ...	... To be charged directly to the particular cost job.

The Budget figures do not refer to any particular company and are merely used for purposes of illustration.

The Distribution of Overhead Charges

After the Budget is compiled the distribution of overhead charges for the ascertainment of process rates must be assessed and this is demonstrated in Table II. The procedure adopted to distribute the Budget to each productive department or process is explained. The basis of the allocation for each account is stated, and the process departments are indexed by progressive numbers 6 to 18. At the foot of this account the yearly rates are expressed as total sterling overhead rates per week. Also the separate rates for each production unit are

calculated. These rates are known as machine hour rates, and for costing purposes they are expressed in pence. The only information excluded at this stage are the direct piece-work wages, and machine output per unit hour.

This method of setting out the overheads is found very useful in actual practice, the whole picture is seen at a glance, and the information contained, expressed in sterling, is easily understood without the necessity for further reference to financial figures.

It will be noted that the operating machinery is also listed for the purpose of fixing machine rates.

Having now prepared a detailed breakdown of the overhead expenses there is ample scope for cost investigation under any conditions of production. Such items as idle plant loss expressed in sterling may now be tabulated, also reductions in costs per unit of output effected by cutting out any unnecessary process. Any other practical changes for increasing efficiency are readily costed and compared.

Idle plant loss, is tabulated each week, and posted to a separate account for each department. This account brings to the notice of the management the weekly cost of idle plant expressed in sterling.

Loom Rate per hour (Table III)

For mixed weaving sheds it will be necessary to ascertain the rate per loom/hour for each type or group of looms. Such items as loom area, looms per overlooker, loom horse-power, etc., for each group, must be known. Each group of looms must be regarded as a separate department, or process, and must be allocated the true share of the actual costs incurred in their maintenance.

For example, it would not be correct to charge a proportion of the expense of Jacquard harness or depreciation to plain looms.

In mixed weaving sheds it is not correct to estimate the overhead expenses as a percentage of the weaving wage, loom hour rates and loom time must be the basis of actual production cost.

The Weaving Cost (Table VII)

This is a practical example of the costing of a Jacquard Casement fabric. The assembly of cost rates for several processes, e.g., winding, beaming, have been excluded, the principle employed is the same as that described in spinning.

The cost schedule includes every item of cost actually incurred in the production of this particular fabric when woven in a 45 in. Jacquard loom. Each process is tabulated in the order of actual production sequence which is common to the industry. Full details of costs are stated, and the method of calculating the rates and quantities is given in the examples.

Complete costings entered on printed cost cards for every cloth sort produced, can be filed progressively by cloth sort number for quick reference. The reverse side of each card being printed to show at a glance the progressive orders, margins, and cost variations.

The cost cards so used are a complete history reference for future guidance, and production control.

The Summary of the Costs per yard of the Casement Fabric. Including Spinning of the Yarn and Weaving of the Loom State Fabric

Cost Item	d. per yard	% of total
All labour	2·021	22·6
Overhead	1·782	19·8
Materials	5·153	57·6
	8·956	100·0

Distribution of the Costs for Sales and Administration

The cost rate for sales and administration is expressed as a percentage of the overhead expenses, which are calculated at an hourly rate. This method is more exact than that of relating the costs to direct spinning or weaving wages.

The cost of transport is charged at a flat rate per pound of cloth, this account refers to local transport; alternatively it may be necessary to charge a weight-mileage rate.

		Spinning	Weaving
Sales and Administration	£4,956	2,110	2,846
Transport	2,511	—	2,511
	£7,467	2,110	5,357

	Spinning Room	Weaving Room	Total
Budget Reference No.	12	17	—
Budget Amount	£33,556	£27,861	£61,417
(5) Sales and Administration ...	2,110	2,846	4,956
Percentage of Budget ...	6·2%	10·2%	8·1%
(4) Transport—Cloth	£2,511		

lbs. of cloth woven, 4,900,000=·12d. per lb. flat rate.

Summary Chart of Cost Elements

The three main elements are now analysed and arranged in the following order :—

(1) Direct Labour
Direct Materials
Direct Expenses
} = Prime Cost

(2) Indirect Labour
Indirect Materials
Other Indirect Factory Expenses
} Factory Cost

(3) Sales and Administration Expenses
Transport Expenses
(4) Margin on Total Cost
} = Total cost.

} = Selling Price.

Profit +
Loss −

Cost Control Demonstrated by the Use of Charts and Graphs, revealing Marginal Costs and Trend at a Glance

All costs are expressed in sterling and are readily understood in the works and elsewhere.

The spinning costs, Fig. 1, are expressed in pence per pound of output, and reveal the more costly of the spinning processes where the greatest savings may be made.

The total and departmental cost control charts, Fig. 2, express efficiency in pounds sterling. The various Departments may be sub-divided into processes, e.g., Weaving - Sizing, Looming, Weave Room, Cloth Room.

The total production value (P.V.) is the weekly output of all products extended at the respective standard costs expressed in terms of wages and expenses.

The total cost is the gross total of the payroll plus the overhead expenses per week.

Fig. 1. CARDING AND SPINNING. PROCESS FLOW COST CHART
Wages and Expenses per lb. of yarn.

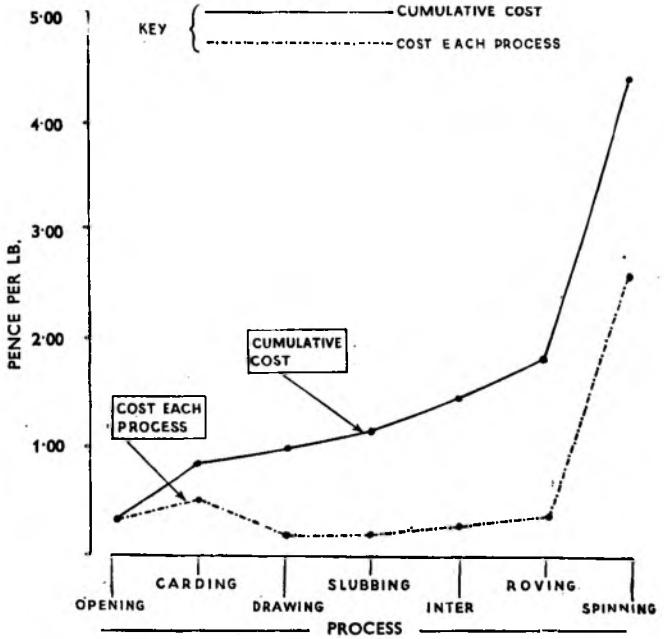

Fig. 2. RECONCILIATION AND COST CONTROL. WEEKLY COST BALANCE CHART
Wages and Expenses

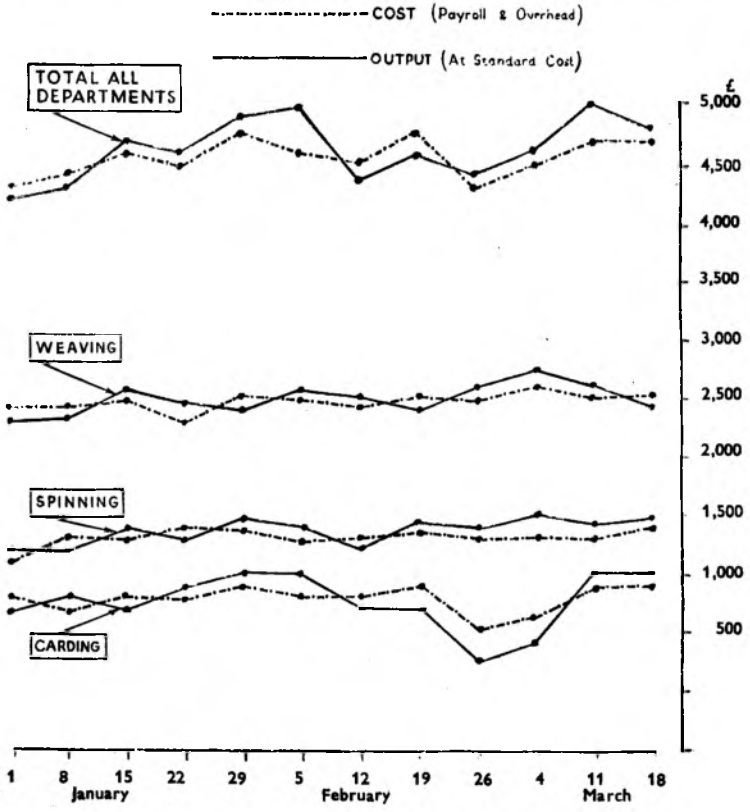

Table I. Budget of Overhead Expenses

Prog. No.	Ledger No.	Trading Account	Basis of Allocation	Budget P.A.	Reference No. 1 — Spinning and weaving	2 — Power account	3 — Maintenance	4 — Transport	5 — Sales and Administration	Direct charges	Prog. No.
					Cost Department.						
				£	£	£	£	£	£	£	
1	10	Rent and rates	Area	1,200	1,100	40	20	25	15	...	1
2	14	Insurance	Actual	1,600	1,279	200	16	105	...	...	2
3	18	Federation levies	Spindle equivalent	600	600	...	...	...	...	...	3
4	22	Salaries	Actual analysis	6,500	3,500	500	1,000	100	1,400	...	4
5	26	Indirect wages	Payroll analysis	45,400	40,000	...	1,200	1,200	3,000	...	5
6	30	Maintenance	—	4,000	...	...	4,000	...	...	...	6
7	34	Depreciation	Machinery value	10,000	8,400	1,200	60	240	100	...	7
8	38	National insurance	Payroll analysis	4,100	3,800	24	120	30	126	...	8
9	42	Coal, power and steam	Power account. H.P. basis	8,000	...	8,000	...	...	...	...	9
10	46	Gas	Area for lighting	20	...	20	...	...	...	...	10
11	50	Electricity power and light	Area for lighting	9,000	1,200	7,800	...	...	...	...	11
12	54	Water	Power account	200	...	200	...	...	...	...	12
13	58	Bobbins	Spinning and weaving	1,500	500	...	...	...	...	...	13
14	62	Brushes	Spinning account	400	1,400	...	...	...	...	...	14
15	66	Card clothing	Spinning account	1,000	1,000	...	...	...	...	...	15
16	70	Card cans	Spinning account	250	250	...	...	...	...	...	16
17	74	Roller skins and cloth	Spinning account	700	700	...	...	...	...	...	17
18	78	Repairs, spinning	Spinning account	2,200	2,200	...	...	...	...	...	18
19	82	Stores spinning	Spinning account	500	500	...	...	...	...	...	19
20	86	Healds and reeds	Direct charges	1,500	...	...	...	...	...	1,500	20
21	90	Sizing	Direct charges	6,000	...	...	...	...	...	6,000	21
22	100	Shuttles	Weaving account	600	600	...	...	...	...	...	22
23	104	Loom cord	Weaving account	150	150	...	...	...	...	...	23
24	108	Pickers	Weaving account	200	200	...	...	...	...	...	24
25	112	Picking bands	Weaving account	250	250	...	...	...	...	...	25
26	116	Skips	Weaving account	300	300	...	...	...	...	...	26
27	120	Weft tins	Weaving account	100	100						27
28	124	Repairs, weaving	Weaving account	2,500	2,500	...	...	...	...	...	28
29	130	Jacquard harness	Jacquard account	1,000	...	...	...	...	...	1,000	29
30	134	Jacquard cards and designs	Direct charge	200	...	...	...	...	...	200	30
31	138	Leather and laces	Spinning and weaving	900	870	20	10	...	...	...	31
32	142	Oil and tallow	Spinning and weaving	1,050	950	80	20	...	...	...	32
33	146	Paper	Spinning and weaving	200	200	...	...	...	...	...	33
34	150	Sponge cloth	Spinning and weaving	300	280	5	15	...	...	...	34
35	154	Sundries	Spinning and weaving	800	450	20	30	...	300	...	35
36	160	Repairs, buildings	Area	700	630	30	15	10	15	...	36
37	164	Repairs, lighting	Area	300	290	5	4	1	...	...	37
38	168	Repairs, power	Horse power	700	...	700	...	...	...	...	38
	172										
39	176	Motor transport	Transport	800	...	...	...	800	...	...	39
40	180	General carriage	Transport	1,200	400	...	...	...	...	800	40
			£	116,920	74,599	18,844	6,510	2,511	4,956	9,500	
					£99,953						

Table II. Distribution of Overhead Expenses

Prog. No.	Ledger No.	Trading Account	Basis of Allocation	Budget P.A.	6 Cotton open and clean	7 Carding	8 Drawing	9 Slubbing	10 Inter.	11 Roving	12 Ring Spinning	13 Winding	14 Warping	15 Sizing	16 Looming	17 Weaving	18 Cloth Room	Prog. No.
				£														
1	10	Rent and rates ...	Area of each process ...	1,100	69	115	19	20	34	76	314	99	35	23	4	274	18	1
2	14	Insurance	Per Insurance Policies	1,279	105	92	36	19	32	60	342	80	20	50	2	371	70	2
3	18	Federation levies ...	Spindle equivalent ...	600	...	...	...	...	...	...	460	36	6	...	...	98	...	3
4	22	Salaries	Payroll analysis ...	3,500	43	116	58	52	76	145	710	356	90	4	9	1,427	414	4
5	26	Indirect wages and holiday pay	Payroll analysis ...	40,000	2,800	5,000	320	600	500	1,400	14,000	600	300	1,800	300	8,880	3,500	5
7	34	Depreciation	Machinery value ...	8,400	495	745	174	174	250	286	3,110	187	39	298	124	2,494	24	7
8	38	National insurance ...	Payroll analysis ...	3,800	57	152	76	68	98	190	1,520	152	45	19	38	1,328	57	8
11	50	Electricity and light ...	No. of lights	1,200	42	72	30	25	30	54	545	18	24	12	12	318	18	11
13	58	Bobbins	Stores analysis ...	1,500	...	...	...	70	160	200	800	100	30	...	...	140	...	13
14	62	Brushes	Stores analysis ...	400	25	40	7	7	12	28	114	35	13	9	3	100	7	14
15	66	Card clothing	Spinning (carding) ...	1,000	...	1,000	...	...	...	...	...	...	...	...	...	...	...	15
16	70	Card cans	Spinning (carding) ...	250	...	120	130	...	...	...	...	...	...	...	...	...	...	16
17	74	Roller skins and cloth...	Stores analysis ...	700	...	...	30	52	73	105	440	...	...	...	...	...	...	17
18	78	Repairs, spinning ...	Expenditure analysis ...	2,200	190	400	60	70	80	100	1,160	100	40	...	...	...	...	18
19	82	Stores, spinning ...	Stores analysis ...	500	40	70	15	20	19	25	266	25	20	...	...	...	...	19
22	100	Shuttles	Weave room	600	...	...	...	...	...	...	...	...	...	...	...	600	...	22
23	104	Loom cord	Weave room	150	...	...	...	...	...	...	...	...	...	...	...	150	...	23
24	108	Pickers	Weave room	200	...	...	...	...	...	...	...	...	...	...	...	200	...	24
25	112	Picking bands	Weave room	250	...	...	...	...	...	...	...	...	...	...	...	250	...	25
26	116	Skips	Weave room	300	...	...	...	...	...	...	200	...	...	...	...	100	...	26
27	120	Weft tins	Weave room	100	...	...	...	...	...	...	...	...	...	...	...	100	...	27
28	124	Repairs, weaving ...	Expenditure analysis ...	2,500	...	...	...	...	...	...	...	...	...	200	80	2,200	20	28
31	138	Leather and laces ...	Stores analysis ...	870	60	130	20	30	35	40	300	12	3	10	...	220	10	31
32	142	Oil and tallow	Stores analysis ...	950	30	50	22	30	90	100	205	9	9	20	10	375	...	32
33	146	Paper	Stores analysis ...	200	3	8	4	3	5	10	80	8	2	1	2	71	3	33
34	150	Sponge cloth	Stores analysis ...	280	4	11	5	5	7	13	115	11	3	2	2	98	4	34
35	154	Sundries	Stores analysis ...	450	7	19	9	8	12	23	165	19	5	3	4	169	7	35
36	160	Repairs, buildings ...	Area and expenditure...	630	40	67	11	12	19	43	176	57	20	13	2	158	12	36
37	164	Repairs, lighting ...	Area and expenditure...	290	10	17	7	6	7	14	133	4	6	3	3	76	4	37
40	180	General carriage ...	Expenditure analysis ...	400	30	40	10	20	30	40	70	30	...	20	10	60	40	40
42	Transfer	Power account ...	Horse power	18,844	1 470	1,988	283	312	539	1,123	6,489	202	112	1,293	14	4,991	28	42
43	,,	Maintenance	Area	6,510	410	691	118	121	200	449	1,842	591	210	134	26	1,613	105	43
		TOTAL OVERHEAD EXPENSES		£99,953	5,930	10,943	1,444	1,724	2,308	4,524	33,556	2,731	1,032	3,914	645	26,861	4,341	
		Process rate per week (49½ weeks) ...		£2,019	120	221	29	35	47	91	678	55	21	79	13	543	87	
		Process Production Units. Machinery				200 cards	14 Preps. each 8 dlys.	1,400 Spindles 14 Frames	3,200 Spindles 28 Frames	9,000 Spindles 46 Frames	100,000 Spindles 250 Frames	3,000 Spindles	16 Frames	3 Frames	2 Frames	1,000 Looms	4 Machines	
		Machine Rate per week in Pence.				266 per Card	62 per Delivery	600 per 100 Spindles	352 per 100 Spindles	242 per 100 Spindles	163 per 100 Spindles	440 per 100 Spindles	316 per Frame	...	...	130 per Loom	...	

Process Costing, Carding and Spinning

The Tabular statement of process costs shown in Tables IV and V, is intended to demonstrate the principle which is used to ascertain the costs of wages and expenses per pound of output at each stage of the process. In practice tables are prepared to show the cost at a glance of every count and quality of yarn spun. Actual output and costs are compared with standard costs for each process weekly.

Table VI. This illustrates the process cost of cotton (including loss) at each stage, and the actual material transfer price after making due allowance for regain (on waste) made at each process. The same principle of costing may be applied to Cotton Doubling.

Table III
Loom Rates per Hour

Prog. No.	Trading Account.	Basis of Allocation	Total P.A.	Description of Looms in a Mixed Shed			
				40 in. Plain	45 in. Dobby	45 in. Jacquard	60 in. Jacquard
Ref. 17		Looms ...	1,000	400	200	200	200
			£				
1	Rents and rates	Loom area	274	95	53	53	73
2	Insurance	Value of looms ...	371	82	62	103	124
3	Federation levy	Loom reed space ...	98	34	19	19	26
4	Salaries	Actual and R.S. ...	1,427	495	280	290	362
5	Indirect wages	Looms per Tackler, etc.	8,880	2,440	1,350	2,025	3,065
7	Depreciation	Loom value ...	2,494	555	415	692	832
8	National Insurance	Payroll analysis ...	1,328	472	236	296	324
11	Electricity	No. of lights ...	318	114	57	71	76
13	Bobbins	Stores analysis ...	140				
14	Brushes	,, ...	100	314	182	228	266
22	Shuttles	,, ...	600				
23	Loom cord	,, ...	150				
24	Pickers	Loom reed space ...	200				
25	Picking bands	,, ...	250	222	127	136	165
26	Skips	,, ...	100				
27	Weft tins	,, ...	100				
28	Repairs, weaving	Actual	2,200	780	410	487	523
31	Leather and laces	Reed space ...	220				
32	Oil and tallow	,, ...	375				
33	Paper	,, ...	71	324	182	190	237
34	Sponge cloth	,, ...	98				
35	Sundries	,, ...	169				
36	Repairs, buildings	Loom area	158	54	31	31	42
37	Repairs, lighting ...	No. of lights ...	76	26	14	17	19
40	General carriage	Loom reed space ...	60	21	11	12	16
42	Power account	Actual H.P. ...	4,991	1,720	941	1,030	1,300
43	Maintenance	Loom area	1,613	560	316	320	417
		TOTAL ...	26,861	8,308	4,686	6,000	7,867
Ref. 6	Jacquard harness	Jacquards, actual ...	1,000	—	—	428	572
		TOTAL FOR YEAR £	27,861	8,308	4,686	6,428	8,439
	Rate per week (49½ weeks)		£ 563	168	94	130	171
	Loom rate per week in pence		—	101	113	156	205
	Loom rate per hour (47½) in pence ...		—	2·12	2·38	3·28	4·32

Table IV
Process Costing—Carding and Spinning
(Expenses as per Budget Table II. Process output based on net spinning output, including waste allowance).

Budget Ref.	Process	Cost unit	Prod. per unit	Ct.	Wages per unit	Expenses per unit	Cost per lb. wages	Cost per lb. expenses	Total cost per lb.
			lbs.						d.
6	Open and clean	Dept.	100,000	—	£50	£70	·120	·168	·288
7	Carding	One card	500	—	d. 100	d. 166 (266d.)	·200	·332	·532
8	Drawing	One Delivery	893	·123	94	62	·105	·069	·174
9	Slubbing	100 Spindles	7,140	·500	620	600	·087	·084	·171
10	Inter.	100 Spindles	3,125	1·20	470	352	·150	·112	·262
11	Roving	100 Spindles	1,110	3·00	190	242	·171	·218	·389
12	Ring spinning	100 Spindles	100	32·00	96	163	·960	1·630	2·590
							1·793	2·613	4·406

The costing of any process for any particular hank, count or quality is ascertained according to actual or target output per unit of production, e.g. :—

$$\frac{\text{Expenses per unit/week}}{\text{Actual output per unit week.}} + \text{Wages cost or piece rate per lb.} = \text{Total cost per lb.}$$

Table V
Analysis of Waste Loss—Progress from Raw Cotton to Yarn

Ref.	Mixing	No. 1 American lbs.	Constants
	Raw cotton	1·000	1·000
6	Scutcher lap	·957	1·045
7	Card sliver	·890	1·123
8	Drawing	·889	1·125
9	Slubbing	·888	1·126
10	Inter.	·887	1·127
11	Roving	·886	1·128
12	Yarn spun	·876	1·141

Cotton constant ... 1·141 $\frac{1,000}{876}$ = Constant 1·141 or 114·10 lbs. of raw cotton is required to produce 100 lbs. of cotton yarn.

Waste regain ... ·200d.

Raw cotton cost ... 7·390d.

Add Basis ... ... ·910

8·300

Carriage ... ... ·120
Levy ... ... ·050
Commission ½% ... ·041

			d.	d.	
8·511	× 1·141	=	9·711	9·711	Clean cotton.
Spinning cost. 32s T. (Fig. 4)		=	4·406	8·511	Raw cotton.
			14·117	1·200	Cotton loss.
Less regain			·200		
Cost on ring bobbin			13·917		
Add Sales, Administration			·100		

Table VI
Total Process Costs and Waste Losses—Carding and Spinning

Budget Ref.	Raw cotton @ 8·511d.	Count	Constants (see Table V)	Cotton loss	Process wages and expenses	Total	Less regain	Total cost	Total cost including cotton
6	Open and cleaning ...	—	1·045	·383	·288	·671	·070	·601	9·112
7	Carding ...	—	1·123	·664	·532	1·196	·090	1·106	10·218
8	Drawing ...	·123	1·125	·016	·174	·190	·010	·180	10·398
9	Slubbing ...	·500	1·126	·009	·171	·180	·005	·175	10·573
10	Inter. ...	1·200	1·127	·008	·262	·270	·003	·267	10·840
11	Roving ...	3·00	1·128	·009	·389	·398	·002	·396	11·236
12	Ring spinning	32·00	1·141	·111	2·590	2·701	·020	2·681	13·917
				1·200	4·406	5·606	·200	5·406	

Table VII
The Weaving Cost
Cloth Costing for a Casement Fabric

Woven in a 45 in. Reed Space Jacquard Loom

Construction :	Cloth width	length	Ends per inch	Picks per inch	Warp	Weft
	37 ins.	100 yds.	79·5	47	32s American 200s Denier rayon	16s American

(1) MATERIAL COST.

				d.	d.	Cost per 100 yards d.
(*a*) *Warp.*	5·84 lbs.	32s American	@14·01 (Ref. Table V)		81·81	
	6·61 ,,	200 Denier	@53·00		350·33	
	·26 ,,	Selvedge 2/40	@27·00		7·02	
	·15 ,,	Warp waste on	6·10 lbs.		2·22	
	12·86					441·38
(*b*) *Weft.*	13·44 lbs.	16s American	@13·50		181·44	
	·67 ,,	Waste	@13·50		9·07	
	14·11					190·51
						631·89

(2) WEAVING PROCESS COSTS :

Ref.	3	Winding	5·84 lbs.	@1·14		6·66
,,	4	Beaming	5·84 ,,	@ ·49		2·86
,,	5	Sizing		@ ·30	Material	
				@ ·90	Overhead	7·01
,,	6	Looming	$\frac{2{,}920 \text{ ends} \times 36\text{d.}}{15 \text{ cuts} \times 1{,}000}$			7·00
,,	7	Cards. 8 in. design. 250 cuts				10·80
,,	8	Clothroom				25·00
,,	9	Weavers' Wages : (*a*) List Price (Uniform List) 99·00 (*b*) Hourly rate. $\frac{23·4 \times 2·45}{4} = 13·15$		d. 99·00	+4%	116·63
,,	10	Weaving Expenses. 23·4 hrs. @ 3·28 (Table III)				76·75
,,	11	Sales, Administration and Transport. S. & A. 10·2% ×76·75 = 7·83 Transport 26·15 lbs. @ ·12 = 3·26				11·09
						263·80

COST PER 100 YARDS = 895·69
COST PER YARD = 8·9569

Calculation of Material Quantities per 100 yards of Grey Cloth

(*a*) COTTON WARP.

$$\frac{1{,}440 \text{ ends} \times 109 \text{ tape length}}{32 \text{ counts} \times 840 \text{ yards}} = 5{\cdot}84 \text{ lbs.}$$

RAYON WARP.

$$\frac{1{,}440 \text{ ends} \times 102{\cdot}5 \text{ tape length} \times 200 \text{ denier}}{840 \text{ yards} \times 5{,}314 \text{ constant}} = 6{\cdot}61 \text{ lbs.}$$

SELVEDGE.

$$\frac{40 \text{ ends} \times 109 \text{ tape length}}{2/40 \text{ counts} \times 840 \text{ yards}} = {\cdot}26 \text{ lbs.}$$

(*b*) WEFT. Cloth reed space. $\frac{2{,}920 \text{ ends}}{76 \text{ reed}} = 38{\cdot}42$ inches.

$$\frac{38{\cdot}42 \text{ in.} \times 47 \text{ pick} \times 100 \text{ yards}}{16 \text{ counts} \times 840 \text{ yards}} = 13{\cdot}44 \text{ lbs.}$$

Ref. 9, 10.

Weaving time @ 75% efficiency.

$$\frac{47 \text{ picks} \times 100 \text{ yards} \times 36 \times 100}{60 \text{ mins.} \times 160 \text{ p.p.m.} \times 75} = 23{\cdot}40 \text{ hours (including gaiting).}$$

Summary: WEAVING CONVERSION COST (Production Value)

	per 100 yards. d.	%
Weaving piece rate—Uniform List	= 99·00	= 37·50
Other weaving department wages and expenses cost	= 155·28	= 58·80
Winding and beaming cost	= 9·52	= 3·70
Production value	263·80	100·00

Review

THE McNAIR REPORT ON THE TRAINING OF TEACHERS

This Report, recently published by the Board of Education (Teachers and Youth Leaders, H.M. Stationery Office, price two shillings net), is the work of a Committee appointed in 1942 by the President of the Board to advise upon the principles which should guid the Board in future with regard to the supply, the methods of recruitment and the training of teachers and youth leaders. The Chairman of the Committee was Sir Arnold McNair, Vice-Chancellor of Liverpool University, and the interests of technical education and industry were ably represented by Dr. A. P. M. Fleming, Director of Metropolitan-Vickers Electrical Co., Ltd. The Textile Institute and several of its members were amongst those who gave evidence.

In order to put into effect the vast educational programme foreshadowed in the Education Bill, it is estimated that between 50,000 and 90,000 teachers, in addition to 200,000 employed in 1938, will be required, with an estimated wastage, to be replenished, of about 15,000 a year. The recruitment and the training of this great army present stupendous problems, which the Report faces squarely and attempts boldly to solve. It shows clearly that " the existing arrangements for the recognition, the training and the supply of teachers are chaotic and ill-adjusted even to present needs " (par. 58) and that " nothing but drastic reforms involving the expenditure of considerable additional sums of public money will secure what the schools need and what children and young people deserve " (par. 12).

To readers of the *Journal of the Textile Institute*, Part III is the most important section of the Report. It is so important, indeed, that no one interested in technical education, whether from the educational or the industrial point of view, can afford to neglect it. With breadth of vision, clear analysis, strength of statement and sound deduction it puts the case for technical education and technical teachers more cogently than it has ever been put before in an official document.

The keynote is struck in the Introduction: " Technical education in this country has never received the attention it deserves " (par. 381); " The good technical teacher is no mere technician, he is also an interpreter of the modern

world " (par. 382); " Technical teachers, regarded collectively, constitute a key group in industrial development " (par. 384). The Report then proceeds to discuss in detail the present position and the future needs of technical education and technical teachers and points out many improvements necessary to attract teachers of good quality and to enable them to serve efficiently.

A valuable section of the Report deals with the ever-present problem of the co-operation of industry and commerce with technical education. Important suggestions are made, the most novel of which is " that the Board of Education should invite suitable Professional Institutions to establish standing committees whose duty it would be to promote co-operation between industry and commerce and the technical and commercial colleges, with particular regard to enabling teachers by means of periodic returns to industry and commerce to keep abreast of their subjects " (par. 434). The Textile Institute is not in the list of examples of such institutions though it might well have been included.

It is true, as the Committee say, that " the planning of suitable courses of professional training for technical teachers is no simple matter " (par. 437), but they give a very attractive first sketch in the paragraphs (439-444) dealing with the nature of training courses. They conclude, however, that " the right kind of training, its nature and length, can be worked out only as the result of systematic experiment throughout the whole country " (par. 444), and they recommend that " each area training authority should include representatives of technical and commercial education and should appoint a director of technical training to organise courses of training and to promote systematic enquiry into the problems of training technical teachers " (par. 445). This recommendation is so far in advance of previous thought on the subject that it is startling, though welcome.

The Chapter on Salaries (pars. 446-452) will be regarded by some as revolutionary, but by those who know intimately the work and qualifications of the staffs of technical colleges it will be accepted as just. It is reasonable that " the salaries of teachers in technical colleges should be related to the emoluments obtainable by persons of similar qualifications and experience in industry and commerce, in the Services and in Government departments " and that " the salaries of the Heads of the most important departments should be on the professorial level " (par. 452).

It is good to observe how insistent the Report is on the adoption, throughout the teaching service, of the principle of secondment. This principle is even more important to technical teachers than to others because, for efficiency, they must keep in touch with developments in industry and commerce at home and abroad as well as with the progress of educational thought and practice.

The observations on " Young People's Colleges " (pars. 373-380) are provocative of thought, and, perhaps, of some dissent, but they are worthy of careful consideration.

In the other parts of the Report, dealing with Primary and Secondary Schools, the Youth Service and " other important matters," there is much of general interest. If the recommendations are adopted, chaos will be reduced to order, the teaching service will be unified, new avenues of recruitment will be opened even for persons of mature age and the " standing of education " will be improved. The supervision of the training of teachers of all kinds will be the duty of a Central Training Council and the administration that of fully representative Area Authorities. Conditions of service (including salaries) will be improved and there will be only one grade of teacher, the qualified teacher, recognised by the Board.

The Report ends with a significant paragraph (526): " There is one non-material factor which is vital to the greater effectiveness of the teaching profession. England—we do not say England and Wales—has never attached enough importance to education and has therefore never given to the teaching profession the esteem that it needs and deserves. Only if the country experiences a change of heart will teachers receive that degree of respect that is needed to secure for our children their fair share of the services of thevery-best of our fellow citizens."

J. E. DALTON.

Additions to the Library

The following publications have been received in the Library :—

"Technique of Dyeing Rayons." H. A. Thomas. Emmott & Co., Limited, Manchester. Price, 2/6.

"Principles of Dress Design." William H. Hulme. The Maker-Up, London. Price, 5/-.

Institute Diplomas

Elections to Fellowship and Associateship have been completed as follows, since the appearance of the previous list (June issue of the *Journal*):

FELLOWSHIP

JOHN BOULTON, M.Sc.Tech., A.M.C.T.,
Research Chemist, Textile Research Laboratories, Courtaulds Ltd., Bocking.

JOSEPH NOGUERA,
Technical Manager and Director, Casablancas High Draft Co. Ltd., Salford.

CHARLES SMALLEY WHEWELL, M.Sc.(Hons.), Ph.D.,
Lecturer in Cloth Finishing, Leeds University.

ASSOCIATESHIP

OSWALD GLAESSNER,
Technical Advisor, Amalgamated Cotton Mills Trust Ltd., Manchester.

MATTHEW SILCOCK,
Lecturer in Textile Department, College of Technology, Belfast.

WALTER SIMON SONDHELM, M.Sc.Tech., A.M.C.T.,
Textile Technologist, Ashton Bros. & Co. Ltd., Carrfield Mills, Hyde.

ARTHUR HORSFIELD WILD,
Chief Chemist, Dyeing and Shower Proofing Departments, J. Mandelberg & Co. Ltd., Salford.

Institute Membership

The following applicants were elected to membership at the July meeting of Council:

Ordinary

John Anderson, B.Sc., A.R.C.S., 54, Welford Road, Sutton Coldfield, Warwickshire (Manager of Textile Laboratory, Textile Division, Dunlop Rubber Co. Ltd., Fort Dunlop, Erdington, Birmingham).

William Scott Anderson, 49, Northfield Avenue, Edinburgh 8 (Works Manager, Messrs. Munro & Co. Ltd., Restalrig Factory, Edinburgh 8).

Reginald Langham Elliott, Ph.D., B.Sc., F.R.I.C., H.M. Naval Victualling Depôt (Technical Examining Officer).

Alexander Frigyes, 4, Yefei Nof St., Tel-Aviv, Palestine (Textile-Technical Advisor).

Arthur Greenwood, F.C.S., 41, Highfield Hill, Upper Norwood, London, S.E.19 (Manager, Norwood and Dulwich Laundry & Cleaning Co. Ltd.).

M. H. Gutman, c/o Textile Department, The University, Leeds 7 (In Forces).

William Hardy, Carr Cliff, Warley, Halifax, Yorks. (Worsted Mill Manager, Patons & Baldwins Ltd., Clark Bridge Mills, Halifax).

Thomas Henry Ward Hulme, Sunnymead, Ivy Lane, Macclesfield (Weaving Manager, Brocklehurst-Whiston Amal. Ltd., Hurdsfield Mills, Macclesfield).

Arthur Muller, D.Sc., Colline Verte, Jedburgh, Scotland (Technical Controller, North British Rayon Ltd., Jedburgh).

Kenneth William Richmond, Ph.D., B.Sc., BM/YHFM, London, W.C.1 (Research Chemist, B. Laporte Ltd., Kingsway, Luton, Beds.).

William Edward Rose, McConnel & Co. Ltd., Manchester 4 (Managing Carder).

John Colin Schofield, B.Sc., Roseville, Water Lane, Farnley, Leeds (Director, Henry Lister & Sons Ltd., Troydale Mills, Pudsey, Nr. Leeds).

William Ewart Stanley, 7, New Lawn Road, Ilkeston, Derbyshire (Superintendent, Warp Knitting Dept., British Celanese Ltd., Spondon, Derby).

Junior

Robert Astin Holgate, B.Sc.Tech., 66, Raglan Road, Burnley, Lancs. (H.M. Forces).