FIGURING MACHINE INSTRUCTION
IN THE PUBLIC HIGH SCHOOLS OF OKLAHOMA CITY

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by

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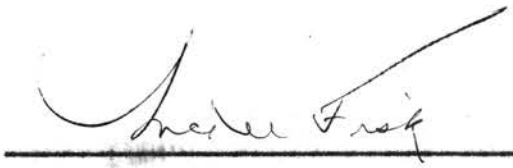

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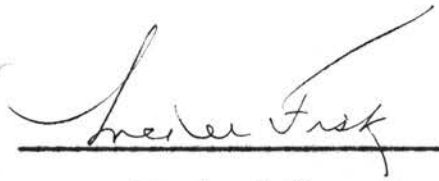

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CHAPTER I

1. Purpose of the Study

This study is a survey of the flow of work through figuring machines used in business houses in Oklahoma City with a recommended course of study for use in the public high schools of Oklahoma City.

It is the purpose of this study to:

a. discover the extent to which figuring machines are used in the Oklahoma City business community;

b. find what machine applications are made to figure work and figure records of businesses in Oklahoma City;

c. construct a course of study suitable for use in the public high schools of Oklahoma City, the content of which shall be based on the machine applications actually made to business records in Oklahoma City as revealed by this study.

Figuring machines are considered to be any of the following:

1. adding-listing machines
2. posting machines
3. bookkeeping or billing machines with accumulating registers or with other calculating devices
4. key-drive calculators
5. crank-drive calculators

Cash registers are not considered because the training needed by operators of most cash registers is negligible and can be given on the job in a short time. Moreover, there are a number of applications of cash registers to figure records, and to attempt to teach these would require training in a succession of plans that represent wasted time for the most part.

2. The Problem

Machine training programs are a comparatively recent addition to the secondary school commercial curriculum. In a report first made public in 1925, Frederick G. Nichols said,

> The need for clerical workers who are skilled in the use of various calculating devices is universal.
> . . . . . .
>
> Further attempts should be made to determine the need for highly skilled calculating machine operators, the amount and kind of training required for this work, and the place of such courses in the public and private secondary-school program. In the meantime, sufficient equipment should be installed in secondary schools to insure a reasonable degree of skill of this sort for all pupils who are preparing for office work.[1]

This statement indicates that machine training programs were not extensively offered prior to 1923, the first year of the survey made in cooperation with the National Association of Office Managers.

The challenge to investigate the needs for a training program is clearly stated in the above quotation. The most logical place to look for materials from which to construct a suitable training program is in the business offices where trainees are likely to find employment.

The method of gathering the information is of paramount importance, for the accuracy of conclusions and the effectiveness of the training program devised depend upon the degree of success attained in gathering the desired data.

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1 Nichols, Frederick G. A New Conception of Office Practice, Harvard University Press, 1927, p 28

It was thought that merely knowing the number of machines of each kind would not be enough because some machines are so flexible as to have several possible applications to figure work. Business customs of the community, the agressiveness of machine distributors, and the kinds of businesses in the community all influence the use made of machines.

So far as can be determined, there has never been a study in Oklahoma City to determine what should be included in a training program for machine operators. In addition, the lack of a placement and follow-up service makes it virtually impossible to help more than a small fraction of those who enroll in the training course to find employment. For the same reason the school has no way of knowing what duties its trainees are performing on the job, or how efficiently they are performing those duties.

Information as to how those now employed as machine operators were selected and how personnel managers select the employees for positions requiring machine operation will be of assistance in planning a really workable training program. Therefore it was decided to include questions about how operators were chosen in the study of work flowing through the machine equipment.

3. Method

It was decided to make all contacts through personal calls. By so doing it was thought that many incidental facts which would inevitably be missed in a questionnaire would be discovered

and that such facts would make the accounting problems responsible for machine applications clearer. Because some organization of information is necessary in order to study it, some thought was given to the form in which data were to be gathered. Information was wanted about the kinds of machines used, how large the installations, the types of calculations or other figure applications, the size of factors involved, where the figures originate and what use is made of the results of the figuring operation, how a particular operation is related to the whole accounting picture, and any incidental factors.

Accordingly, a check sheet was worked out and printed on five different colors of paper, each color to be used for recording data about a particular class of equipment. A copy of this sheet on white paper will be found in the appendix.

Descriptions of the various accounting applications and any other interesting or unusual facts are noted on the back of one or more of the sheets used to record data from the particular firm involved. The firm's name is written on the face of each sheet used to gather data from that particular firm so that different classifications of the data can be made without making recombination of all sheets from a single firm impossible.

It was decided that a beginning might be made by determining the number of employees in a given field and matching this figure against the number of machine units of the various classes used in that field. The help of the Chamber of Commerce statistician was therefore sought, and a break-down

of businesses by types was obtained from him. These figures included the wholesale and retail establishments in Oklahoma City. No data on banks, transportation units, or utilities were available.

Since the study is concerned primarily with figuring machines and the work flowing through them it seemed that the distributors of those machines might furnish valuable information as to machine populations among the various classifications of businesses as revealed by the break-downs that were furnished by the Chamber of Commerce statistician. In addition, it seemed probable that these same distributors could furnish the names of users and contacts which would make the investigation more sure of success. With this information it was thought that the fields most likely to yield employment for trainees could be established and a start made on finding the nature of what should be taught.

Some difficulty was experienced in securing the information about machine populations by the method just outlined. Because of the size and cost of the clerical effort involved, the Burroughs Adding Machine Company was unable to furnish a break-down of machine populations. Felt & Tarrant, manufacturers of the Comptometer, has a company rule against giving out information about machine populations to anyone.

The distributors of Monroe, Marchant, and Frieden calculators were reluctant to permit study of service records to determine numbers and classifications of users, and would give only approximate figures. Other distributors, notably Under-

wood-Elliott-Fisher and Remington-Rand, were most cooperative, and provided reliable data.

As a result of the failure to secure sufficient data on machine populations from the distributors, it was necessary to make a machine survey. Obviously, the coverage of this survey could not be 100 per cent, but the numbers of machines are sufficiently large to be significant and the numbers of businesses of various kinds compare favorably with the figures furnished by the Chamber of Commerce statistician.

All distributors of machines in Oklahoma City furnished lists of users likely to be willing to cooperate in this study. In addition, they were most helpful in supplying the names of the people in charge of the various offices. As a result there was not a single instance in which an interview was refused. The success of this part of the study is largely attributable to the contacts furnished by the machine distributors. In several instances the office managers of the firms studied expressed great interest in the study and offered to help in any way they could.

The user lists from the machine distributors also made possible a check to insure the inclusion of all types of machines and sizes of installations.

Three factors arising from within the schools themselves affect the course of study which is devised for use in them. These factors are, briefly, the time which may be devoted to the training program in the pupil's schedule; the equipment which the school can furnish, and the place in the curriculum in which the work may be taught. These factors are all inter-

related. A careful study of the various curricula that are offered in the commercial department of the school is necessary to determine where the work may be most effectively taught. These considerations are more fully discussed in connection with the development of the course of study.

The equipment which may be made available is a very important factor in the construction of a training program. Meehan says,

> The equipment should be determined by the machines in actual use in the immediate area.[2]

From a practical standpoint it is necessary also to consider what school equipment is already available and the financial limitations on additional purchases. A careful analysis of what is needed should be made on the basis of what is used in the community. Subsequent purchases should then be made of those types of equipment in which the school is most deficient.

The pioneering work of Nichols[3] in studying what should be taught clerical help has inspired several subsequent studies of office machines. They range from a study to determine what kinds of equipment should be made available for office practice in Pennsylvania secondary schools, a study made in 1934 by Luithlen;[4] a survey of machines and appliances in Indianapolis

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2 Meehan, James R., Hunter College, New York City, "Office Practice in the Small High School," National Business Education Quarterly, May 1937, V 4, p 62

3 Nichols, Frederick G. Op. Cit.

4 Luithlen, David F. A Survey of Office Practice Equipment in Pennsylvania High Schools and a Philadelphia Business Office to Determine Equipment for a Course in Office Practice, Temple, M. S. 1934

with the purpose of determining the need for a training program, made by West[5] in 1930; and another by Steele[6] in Denver in 1938, in which was developed a recommended course of study for the machine training program in Denver schools below college level. Secretarial machines were included in all these studies. The course of study developed by Steele was based on the number of machines of each class found, and the number of full-time and part-time workers found using them. Information for the study was obtained by questionnaire.

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5 West, Winnifred G. Survey of Machines and Appliances Other Than Typewriters Used in Indianapolis Business Offices, With Recommendations for the Training of Prospective Operators, Indiana, M. S. 1930

6 Steele, Annabel K. A Survey of Office Machines (other than typewriters) Used in the Business Houses in Denver With a Suggested Course of Training for Machine Operators, University of Denver, M. S. 1938.

CHAPTER II

Findings of the Survey

The materials gathered in the survey are presented under the following headings:

1. Data furnished by the Chamber of Commerce statistician.
2. Machine units found in use by the machine survey arranged by classes of business houses or users.
3. Selection of case studies

The data taken from the Chamber of Commerce statistician's compilations are intended to indicate the extensiveness of the business community, the classes of businesses most likely to be important for study, and to set the pattern for classifying machine users.

The presentation of the results of the machine survey is intended to reflect the reason for the selection of the types of businesses studied and the selection of materials included in the course of study outline.

The discussion of the selection of case studies is intended to indicate the reasons for selecting the particular cases included in the sample.

Data Furnished by the Chamber of Commerce Statistician. The data furnished by the Chamber of Commerce statistician are for the year 1935. No subsequent data analyzed in the same way are available. Similar information about banks, transportation units, utilities, and government offices is not available. Tables I and II show the available information.

TABLE I

Retail Establishments in Oklahoma City

Data for the year 1935 furnished by the Chamber of Commerce statistician

KIND OF BUSINESS	Number of Stores	Sales (add 000)	Number of Proprietors	Number of Employees	Employment ratio	Payroll (add 000)
Food Stores	672	13,023	625	1,213	1.95	991
General Stores (with food)	4	692	5	57	13.5	54
Gen. Mdse. Group	41	12,218	23	1,914	46.68	1,669
Apparel Group	111	6,500	52	873	7.86	849
Automotive Group	211	12,850	204	1,201	5.69	1,346
Filling Stations	377	5,001	301	683	1.8	576
Furniture-Household Group	75	3,830	56	620	8.26	532
Lumber-Hardware Group	83	5,117	65	563	6.78	589
Eating and Drinking Places	413	2,993	431	1,194	2.89	566
Drug Stores	119	4,398	82	774	6.5	595
Other Retail Stores	193	4,729	136	678	3.5	769
Second Hand Stores	121	959	130	165	1.36	126
TOTALS	2,420	72,398	2,110	9,935		8,662

NOTE: The above table should be read as follows: 672 food stores had total sales for the year 1935 of $ 13,023,000; were owned by 625 different proprietors; employed 1,213 people in addition to the proprietors, with an employment ratio of 1.95; and a total payroll of $ 991,000.

A study of Table I shows that food stores, filling stations, eating and drinking places, and second hand stores are small establishments with from one to three employees each. Such small businesses have very simple records and therefore need very little figuring machine equipment.

Table I also indicates that the general merchandise group, on the other extreme, with an employment ratio of 46.68, may have large volumes of paper work with its attendant extensive use of figuring machine equipment. The large department stores may account in part for the size of the average.

General stores with food might well have been included in the group with other general merchandise stores except that food is their most important line. They too have a high employment ratio (13.5.) and therefore are large establishments.

Some fairly large businesses should be found among the lumber and hardware group. With an average employment ratio of 6.78 some very extensive use of figuring machines should be found in this group.

Drug stores show a surprisingly high employment ratio and it may well be that a small number of large establishments are forcing this high general level.

Establishments dealing in wearing apparel and household furnishings all show rather large employment ratios, and the furniture group and apparel group are no exceptions. With employment ratios of 8.26 and 7.86 respectively, they have well over the average number of employees for all retail establishments, which is slightly over 4.

TABLE II

Wholesale Establishments in Oklahoma City

Data for the year 1935 furnished by the Chamber of Commerce statistician.

KIND OF BUSINESS	Number of Stores	Sales (add 000)	Number of Proprietors	Number of Employees	Employment Ratio	Payroll (add 000)
Full Service and Limited Function Wholesalers	268	47,110	143	2,490	9.25	3,624
Manufacturers' Sales Branches - with stocks	56	40,954	2	1,076	19.21	1,856
Manufacturers' Sales Offices - without stocks	16	9,273		187	11.7	314
Bulk Tank Stations	25	5,297	6	299	11.96	543
Agents and Brokers	65	49,390	56	254	3.89	440
Assemblers	11	6,833	9	76	6.96	104
All Other	5	361	4	7	1.4	10
TOTAL	441	158,875	216	4,382		6,881

NOTE: The above table should be read as follows: 268 full service and limited function wholesalers had, in the year 1935, a total sales of $ 47,110,000; were owned by 143 different proprietors; employed 2,490 workers, an employment ratio of 9.25; with a total payroll of $ 3,624,000.

Further study is indicated for the group of sixty-five businesses listed in Table II as agents and brokers. The employment ratio of 3.89 is low, but some fairly large firms may be found among them.

The five listed in Table II as "all other" can very definitely be dismissed from further consideration since their employment ratio is only 1.4. Out of so small a group such a low employment ratio indicates that all are very small businesses and will have such a small volume of paper work that little or no figuring machine equipment will be found in use among them.

It is very interesting to note that manufacturers' sales branches with stocks are on the average, larger than the sales offices of manufacturers that do not carry stocks.

Bulk tank stations, with an employment ratio of 11.96, indicate that the petroleum industry is represented in Oklahoma City with some fairly large offices.

Another important group is the full-service and limited function wholesalers with an employment ratio of 9.25. Some large wholesalers with wide distribution over the state are numbered among this group.

While the assemblers have a high employment ratio, the group is small, and therefore of no great importance to this study, especially in view of the similarity between their business and that of the wholesalers. These assemblers, incidently, are engaged in assembling agricultural raw materials such as broom corn, etc.

Machine units found in use by the machine survey. There has been some re-grouping of businesses in Tables III and IV but in general they follow the same classifications used in Tables I and II. These changes in grouping were made for convenience in tabulating machine equipment, and are believed to be in no way detrimental to the study.

Agents and brokers, as well as assemblers, proved to be of little importance as users of figuring machine equipment as a glance at Table III will show. It has already been pointed out in Table II that these businesses are limited in number and do not have very high employment ratios. Under these conditions it is to be expected that little figuring machine equipment is to be found in these classes of business.

A comparison between the findings as reflected in Tables III and IV and the data in Tables I and II shows that more groups of retail businesses were found to be of little importance to this study than of wholesale businesses. Table I led to the expectation that food stores, filling stations, eating and drinking places, and second hand stores would be found to use very little machine equipment. From Table IV the indications are that this is very largely true, although there is an important exception in the case of the dairies and dairy products companys, which are classed as food stores.

General merchandise, household furnishings and furniture stores justified the expectation that they would be found to use a number of figuring machines. Table IV also indicates that users of figuring machine equipment are to be found in

TABLE III

Wholesale and Other Non-Retail Businesses Canvassed and the Machines They Use

KIND OF BUSINESS	Total Canvassed	Adding-Listing Machines			Posting Machines			Bill.-Bkkpg Machines			Key-Drive Calculators			Crank-Drive Calculators			Use no Machines	
		Users	% total Canv.	Units used	Users	% total Canv.	Units used	Users	% total Canv.	Units used	Users	% total Canv.	Units used	Users	% total Canv.	Units used	Stores	% total Canv.
Wholesale																		
Full Serv. and Lim. Function	223	223	100.	391	18	8.	24	76	34.	83	72	32.	220	58	26.	63	0	0.
Mfr's Sales Branch & Office	70	70	100.	205	21	30.	39	32	45.7	65	68	97.1	134	70	100.	84	0	0.
Petroleum and its products	61	61	100.	483	12	19.7	21	8	13.1	19	40	65.6	78	19	31.1	25	0	0.
Agents & Brokers	60	60	100.	68	13	21.6	13	0	0.	0	7	11.6	7	2	3.3	2	0	0.
Assemblers	10	10	100.	15	5	50.	5	4	40.	4	8	80.	18	2	20.	2	0	0.
totals	424	424	100.	1162	69	16.27	101	119	28.	171	195	46.	457	151	35.6	176	0	0.
Other Non-Retail																		
Transportation	20	20	100.	55	0	0.	0	2	10.	2	7	35.	15	5	25.	10	0	0.
Banks	12	12	100.	54	12	100.	33	0	0.	0	10	83.3	35	3	25.	5	0	0.
Utilities	4	4	100.	37	4	100.	16	2	50.	3	4	100.	75	4	100.	11	0	0.
Government	21	21	100.	243	21	100.	31	21	100.	35	21	100.	145	21	100.	50	0	0.
totals	57	57	100.	389	37	64.9	85	25	43.86	40	42	73.7	270	33	57.9	76	0	0.

NOTE: this table should be read: of 223 businesses canvassed 223, or 100% used 391 adding-listing machines; 18, or 8% used 24 posting machines; 76, or 34% used 83 bookkeeping-billing machines; 72, or 32% used 220 key-drive calculators; 58, or 26% used 63 crank-drive calculators.

TABLE IV

Retail Businesses Canvassed and the Machines They Use

KIND OF BUSINESS	Total Canvassed	Adding-Listing Machines			Posting Machines			Bill.-Bkkpg Machines			Key-Drive Calculators			Crank-Drive Calculators			Use no Machines	
		Users	% total Canv.	Units used	Users	% total Canv.	Units used	Users	% total Canv.	Units used	Users	% total Canv.	Units used	Users	% total Canv.	Units used	Stores	% total Canv.
Food Stores	569	366	64.5	386	1	.15	1	0	0.	0	18	3.	21	2	.3	2	199	34.9
Gen. Merchandise, H. Hold & Furn.	194	172	88.7	275	23	12.	24	61	31.	92	61	31.	88	4	3.6	7	22	11.3
Automotive	189	156	82.5	158	12	63.	12	3	1.5	3	5	2.6	16	0	0.	0	30	15.9
Filling Stations	350	234	66.9	249	2	.5	2	2	.5	2	2	.5	2	0	0.	0	124	35.4
Lbr. Bldg. Mat., Hardware	76	54	71.	97	15	19.7	15	5	6.6	5	18	23.7	19	9	11.8	13	15	19.7
Eating and Drinking Places	320	144	45.	144	1	.3	1	0	0.	0	1	.3	1	0	0.	0	174	38.7
Drug Stores	114	84	73.7	92	3	2.6	3	0	0.	0	8	7.	12	1	.9	3	30	26.3
Miscel. Stores	150	142	94.6	232	16	10.6	16	17	11.3	17	32	21.3	40	30	20.	35	8	5.3
Second Hand Stores	85	43	50.6	43	0	0.	0	0	0.	0	2	2.35	2	0	0.	0	41	48.2
totals	2047	1395	18.15	1676	73	3.56	74	88	4.3	119	147	7.21	201	59	2.9	60	643	31.4
GRAND TOTALS TABLES III & IV	2528	1876	74.2	3227	179	7.1	260	232	9.2	330	384	15.2	928	243	9.6	312	643	25.4

NOTE: this table should be read: Of 569 food stores canvassed, 366, or 64.5% use 386 adding-listing machines; 1, or .15% uses a posting machine; none use billing-bookkeeping machines; 18, or 3% use key-drive calculators; 2 or .3% use crank-drive calculator each.

the automotive group, lumber and building materials group, and the stores classed as miscellaneous.

Some very interesting comparisons may be made from a study of Tables III and IV. For instance, wholesalers use almost three adding machines each, while other non-retail establishments average more than six each. Retail stores have an average of less than two each.

Key-drive calculators appear to be the next most widely used machines. The averages are: wholesalers, slightly more than two each; other non-retail, more than six each; and retail establishments, less than two each.

Table III shows that utilities and government offices account for the bulk of machines used by the non-retail group, while petroleum and its products account for the high average of adding machines; and wholesalers account for the highest average number of key-drive machines.

Crank-drive calculators are used by 35.6 per cent of the wholesale firms, while billing-bookkeeping machines are used by only 28 per cent, and posting machines by even less, 16.27 per cent. However, in the "other non-retail" group posting machines are used by more firms than are billing-bookkeeping machines. Among retail establishments there are more users of billing-bookkeeping machines than of posting machines, and more users of posting machines than of crank-drive calculators.

Individual group comparisons show government offices average more adding-listing machines than any other group; while utilities average more key-drive calculators, more crank-drive calculators, and more posting machines; while manufacturers,

with an average of 45.7, use more billing-bookkeeping machines per business. Second hand stores have the highest percentage of units with no machines.

It is interesting to note that the wholesale group and the other non-retail group both show 100 per cent users of adding-listing machines. The next highest per cent of both is in key-drive calculators, although the percentage is higher among the other non-retail group.

Selection of Case Studies

Study of Tables III and IV shows that extensive users of figuring machines are to be found in thirteen classifications. Among these are three wholesale, six retail, and four classified as "other non-retail" establishments. It appears evident that the sample selected for study should be taken from these groups.

The Retail Group. The six retail classifications are: food stores, general merchandise, automotive, lumber-building materials, drug stores, and the miscellaneous group.

Food stores were included because it was found that in spite of the low employment ratio shown in Table I, the machines survey disclosed some stores in this classification that use figuring machine equipment extensively.

The Wholesale Group. The three wholesale classifications are: full-service and limited function wholesalers, manufacturers' sales offices and sales branches, and petroleum and

its products. Reference to Table II suggests the importance of these groups and Table III indicates the extent to which they use figuring machines.

A study of Table III shows that the agents and brokers do not use enough machine equipment to justify including them in the sample.

The assemblers, while using some machine equipment, are similar to the wholesalers and are not represented in the sample for this reason.

Other Classifications. The four other classifications are: transportation, banks, utilities, and government offices. There were no data available concerning the number of employees of any of these groups. Some indication of the size of the financial community as represented by the banks may be had by reference to the Appendix, Table I. Table III in this chapter indicates the importance of all these offices as users of figuring machine equipment.

The Sample

Seventy-five businesses were chosen from lists furnished by machine distributors, including all sizes of installations and various makes of machines, and studied to determine how machines are being used in Oklahoma City. This list includes numerous firms in some classifications and only a few in others.

Out of this list thirty-three are selected as representative on the basis of size of machine installations, kinds of businesses using figuring machine equipment, and variety of

machine applications to the figure work of each kind. At the same time an effort is made to avoid over emphasizing any group of businesses and to eliminate useless repetition of the same applications. Table V presents these thirty-three businesses classified under the thirteen headings listed above.

Training of Operators

Of the thirty-three establishments represented in the sample, ten would make no statement as to preference for trained or untrained figuring machine operators. This group uses eight key-drive calculators and six of those eight machines are used by skilled operators.

Of the twenty-three who expressed preferences, eighteen employ 108 trained key-drive operators. Two of these offices also employ 40 additional key-drive operators not trained before being employed. Three offices employ no trained operators and use 12 key-drive machines. This makes a total of 114 trained key-drive operators and 54 untrained.

Two offices prefer to employ trained operators for billing bookkeeping machines. They use 16 operators, which leaves 28 out of the total of 44 from Table V who learned on the job.

One office prefers to employ trained or otherwise skilled operators for posting machines. This office employs six operators, which leaves a total of 28 out of the 34 listed in Table V who learned on the job.

No offices expressed a preference for trained crank-drive calculator operators.

TABLE V

Machine equipment used in 33 offices
classified by kinds of businesses

No. of stores		Adding-Listing	Posting	Billing-Bkkpg	Key-Drive	Crank-Drive
	FOOD STORES					
1	Dairy Products Company	2	0	0	2	1
	GENERAL MERCHANDISE					
2	Department Stores	10	1	7	4	2
2	Men's Furnishings Stores	3	2	4	1	0
1	Variety Store Chain	1	0	2	3	1
	AUTOMOTIVE					
1	Regional Office (manufacturer's)	2	0	1	6	0
1	New Car Sales Company	2	0	0	0	0
1	Tire and Accessory Distributor	1	1	0	0	0
	LUMBER & BUILDING MATERIALS					
2	Lumber Dealers	4	1	0	2	3
	DRUG STORES					
1	Retail Drug Chain	3	0	0	2	3
	MISCELLANEOUS					
1	Amusement Chain	2	0	0	6	0
1	Stationery and Office Supply	1	2	0	3	0
	FULL SERVICE & LIMITED FUNCTION WHOLESALERS					
1	Full Service Wholesaler	1	0	2	3	1
2	Food Wholesalers	3	1	2	8	0
1	Food Wholesaler with retail outlets	10	1	0	20	0
	PETROLEUM PRODUCERS & DISTRIBUTORS					
2	Oil Company Offices	21	2	2	4	3

Continued on following page

TABLE V (continued)

Machine equipment used in 33 offices classified by kinds of businesses

No. of stores		Adding-Listing	Posting	Billing-Bkkpg.	Key-Drive	Crank-Drive
	MANUFACTURERS					
1	Steel & Irom Works	1	0	1	4	1
1	Packing Plant	6	0	5	15	3
1	Mill & Elevator	8	3	0	11	18
	TRANSPORTATION					
1	Bus Line	1	0	0	2	1
1	Transfer & Storage Company	2	0	0	0	0
1	Street Railway Company	4	0	0	3	2
	BANKS					
1	Commercial Bank	12	6	0	4	0
	UTILITIES					
1	Telephone Company	7	6	0	50	1
1	Electric Company	7	4	0	6	0
1	Gas Company	6	2	1	8	4
	GIVERNMENT					
1	City Board of Education	5	0	1	0	1
1	Auditor, State of Oklahoma	11	2	9	1	1
1	Div. of Okla. Tax Commission	10	0	7	0	1
33	TOTALS	147*	34	44	168	47

NOTE: This table should be read as follows; of the manufacturers, one steel & iron works uses 1 adding-listing machine, 1 bookkeeping-billing machine, 4 key-drive calculators, and 1 crank-drive calculator.

* Key-drive calculators exceed adding-listing machines in this table because the selection of the sample eliminated a number of businesses that use only adding-listing machines. Such businesses are, for the most part, small.

Food Stores. A dairy products company was chosen to represent the food stores because it was found that three or four dairy businesses use most of the figuring machine equipment other than adding machines found under the food stores classification.

General Merchandise Group. Two department stores, two men's furnishings stores, and one variety chain were chosen to represent the general merchandise group because they include various sizes of enterprise and because the special accounting problems of this field as revealed by the study are included.

Automotive. A manufacturer's regional sales office is shown in the automotive group because it is one of the very few offices in the automotive classification that makes extensive use of figuring machine equipment. A new car sales company and a tire and accessory distributor are included to indicate the extent to which figuring machine equipment is used in other businesses in this classification.

Lumber and Building Materials. Two lumber dealers were chosen to represent this group because both employ special office help and appear to be representative as to size. Although the entire group is small, the number of stores using each class of machines as indicated in Table IV makes the group important for study.

Drug Stores. A chain drug company was chosen to represent the drug stores group because only the large organizations use

special office equipment. The number of large drug store organizations is very limited.

The Miscellaneous Group. The managing office for a chain of moving picture houses and a stationery and office supply house were chosen to represent the miscellaneous group. There are several other businesses in the amusement group and other large office supply houses in Oklahoma City so that these two are representative of groups and not isolated cases.

Full-Service and Limited Function Wholesalers. Wholesale houses constitute a large group of users of figuring machine equipment in Oklahoma City. It was found that a variety of machine applications are made to the accounting problems common to this group. One full-service wholesaler, two food wholesalers and one food wholesaler with retail outlets were chosen as representative of the various sizes and types of houses and machine applications.

Manufacturers. A steel and iron works, a packing plant, and a large mill and elevator company have been chosen to represent the manufacturers group. The grain business, the meat packing industry, and a miscellaneous group of small manufacturers make up an important part of local industry. These three were found to be important of themselves and to typify groups important in the business life of Oklahoma City.

Petroleum and Its Products. The petroleum industry in Oklahoma City is engaged in the production of crude oil and the

sales of petroleum products. Refining is not done locally on a large scale. For that reason two oil company offices typical of those operating in this area have been chosen to present in this study. These offices use different machine applications to the same kinds of figure work.

Utilities. Four utilities companies operate in Oklahoma City, the telephone company, an electric company, and two gas companies. Only one gas company serves residential consumers here, the other sells gas only to commercial users in Oklahoma City.

The gas company serving residential consumers and the electric company follow similar accounting procedures and use similar types of figuring machine equipment. For that reason the gas company serving residential consumers is not included in this study. This leaves the telephone company, the electric company and one gas company to represent the group.

Government Offices. Government offices represented in this sample are the Oklahoma City school district, the state auditor's office and a division of the Oklahoma Tax Commission. These include two offices concerned with the expenditure of governmental funds and a tax collecting agency. The characteristic accounting problems incident to the operation of government are represented in these three offices.

Summary. In summarizing it may be pointed out that every kind of business enterprise shown to be important as users of machine equipment in Tables III and IV are represented in this

sample. There is only one extreme case of over representation on the basis of size of the group and that is in the utilities group. However, it was necessary to include three of the four utilities in order to have a representation of all the different accounting problems found in the group.

Machine applications found in the survey are all represented in the thirty-three businesses chosen for the sample and all different sizes of machine installations found in Oklahoma City are included.

CHAPTER III

Use of Machine Equipment

In the preceding chapter the data concerning machine populations and the effect of these populations on the choice of the sample to be studied was discussed. In addition, the effects of different uses made of machines as found from a study of seventy-five businesses chosen from user lists supplied by the various distributors of figuring machines were explained.

This chapter concerns itself with the uses made of machine equipment found in the thirty-three businesses which were chosen for presentation as typical of business houses in Oklahoma City, and the special uses made of equipment by certain firms.

The installations of the various classes of machines used in Oklahoma City have been shown in Table V. There is some overlapping in uses made of the various machines as employed by different businesses. The following discussion delineates the uses to which the various machines are put by the several businesses listed in Table V.

Adding-Listing Machines. In general the adding-listing machines shown in Table V are used for adding short lists of a few figures each, long lists of figures from reports and books, some multiplication in making or proving extensions, finding differences, and in a few cases deducting discounts. No examples of division on the adding machine were found. The applications of this class of equipment made by the various groups of businesses may be summarized as follows:

The three adding machines used by the dairy products company are used to total route books, add up amounts due producers, and for general utility in the office.

The adding machines used by department stores in the sample are used to build up general ledger entries on sales by departments and purchases by departments, for checking the payroll, and for general utility, especially in finding general ledger balances.

Men's furnishings stores make practically the same uses of adding-listing machines as do department stores. General utility work for this group seems to consist mostly of totaling lists of figures of various lengths and finding differences such as net amounts after discounts. These latter are figured only occasionally.

The variety store chain uses its adding machine occasionally to check extensions on purchase invoices and regularly for general utility.

The automobile manufacturer's branch office has one wide carriage adding-listing machine on which it maintains bank control and keeps the payroll summary. Bank control consists of posting checks and arriving at the balance that should be in the bank. Both machines are used otherwise for general utility.

The new car sales company uses its adding machines for practically all figure work. Books are kept by hand and all figures checked by machine. One large use is for figuring payroll.

The adding-listing machine used by the tire and accessory distributor is used to total sales invoices, check balances of customers' accounts, and for general office use.

The lumber companies use their adding machines for checking reports, adding stock records, and for general utility.

The adding machines listed for the local drug chain are used to add payroll, check stock records, and for general utility.

The amusement chain uses one adding machine for general utility and for checking the payroll.

The office supply house uses its adding machine as a checking and general utility machine exclusively.

The steel and iron works uses its adding machine for figuring payroll, maintaining stock records, and for general utility.

The packing plant uses its six adding machines on general figure work. These machines are not assigned, but may be carried about in the office wherever needed.

The mill and elevator uses one adding machine in the elevator office, one in the laboratory, one in the mill office, and five in the accounting department. These machines are not assigned, all are used for general figure work. No particular kinds of work are done on them.

One oil company uses thirteen adding machines, principally to add original tickets from stations. This builds up the sales credit for the day. The other oil company uses eight machines, principally for checking and for adding the general ledger, or other general work.

The transportation units use their adding machines almost exclusively for general utility and for checking other figure work. No important special uses are made of them.

The tellers in the commercial bank use adding machines to check deposit tickets, for totaling and proving daily proof sheets, and to total checks and deposits for cash proof. The personal loans department uses a machine occasionally to make various calculations. The savings department uses adding machines to run lists of savings deposits and withdrawals for proof against totals accumulated in their window-type posting machines. The general bookkeeper uses this class of machine to run tape lists of checks and deposits for proof of machine totals. The transit department uses an adding machine to check other figures and to add daily proof sheets.

The telephone company uses its adding machines in the receiving department for totaling bills to build up the debit for the receivables account and to total receipts at the cashier's window. Machines are used in the payroll department for general utility.

The electric company uses an adding machine to total ledger stubs which are then checked against collections. Another machine is used to total cashier's stubs and this total used to prove the cash sheet. A two-register parallel unit is used to list discounts and total charges by accounting districts. The charges are added whether or not collected in order to build up the debits for the general ledger. Three machines are kept in the cashier's cage to check on cash collections

and are used in conjunction with coin changers. Other machines are used wherever needed for general figure work.

The gas company uses one adding-listing machine in the purchasing office to verify extensions on purchase requisitions. These are used to build up accounts payable vouchers. The treasurer's secretary uses one machine to originate totals for the general ledger, and to check accumulated papers representing media for posting to the general ledger.

The Oklahoma City Board of Education uses four machines in the general accounting office. One of these is used exclusively to check other figure work. One machine with a wide carriage is used for posting the warrant register. Two machines are used to accumulate totals for the ledger and to total encumberances and liquidations as a means of proof of the work done on the bookkeeping machine on which the appropriations ledger is kept. One adding-listing machine is used in the auditor's office to accumulate controls against which other machine calculations are proved.

The state auditor uses several machines in the preparation of, and checking miscellaneous documents. The machines used in the accounting department are in two groups. One group is general utility. The other group is made up of two-register parallel units used to accumulate totals of encumberances and liquidations by funds as proofs for checking with the bookkeeping machines. These machines may be said to be an intermediary between the accounting office and the auditing office. This office keeps the general accounting records for all funds.

The adding machines used by the Income Tax Collections Division of the Oklahoma Tax Commission are used for totaling collections, auditing income tax returns, building up proof totals, and for miscellaneous checking.

Summary. The following important uses are made of adding-listing machines:

1. general use, including short columns of a few figures each, long columns of figures from journals, ledgers, or other sources, taking off discounts, or other miscellaneous figure work;
2. adding long lists of items, either from individual slips to obtain a total for ledger entry, or to obtain figures to be used in proving work done on other machines;
3. checking extensions and addition on invoices, vouchers, and other papers;
4. wide-carriage machines used in making distributions, posting registers, and similar applications;
5. dual-register machines used in totaling parallel items for proof and to build up journal and ledger entries;
6. Proving distributions or columnar journals and similar work.

The first four uses listed above are the most frequently found in Oklahoma City.

Posting Machines. Three uses are made of posting machines in Oklahoma City:

1. To post subsidiary ledgers;
2. Write customer's bill and ledger stubs by repeat print;
3. To write payroll checks and payroll simultaneously.

The telephone company and the electric company use posting machines to write customers' bills, the mill & elevator uses its posting machines to write payroll checks and payroll at the same time. All other users keep subsidiary ledgers on their machines. Three different kinds of subsidiary ledgers were found to be kept on posting machines; accounts receivable, accounts payable, and what is called a detail ledger. The detail ledger is kept by the gas company listed in this study. It breaks down such factors as expenses, fixed capital, depletions, repairs, etc. into individual account items.

The utilities serving residential consumers in Oklahoma City use the stub ledger system on their receivables. A Duplex Addressograph prints the bill and stub form and addresses it in one operation. The addressing plates are arranged in the same order in which the entries are made to eliminate rearranging the materials at the machines. The bills then go to the bill writing machines where the amount of the bill, the amounts of service at the different rates, and an identifying symbol are filled in. Front-feed machines built on posting machine frames are used to make the entries. These are repeat-print machines so that the same entry is printed on the bill and on each of two stubs from the same machine setting. The only calculations made by the machines are the accumulations of items important to revenue control. The calculations necessary to complete the bill have been worked out and placed in tables. The operator simply takes the figures from the tables to set the machine.

The bill and one stub, called the cashier's stub, are mailed to the customer. A second stub, called the ledger stub, is detached and retained by the accounting office.

The machines print a corbon copy of the entries on the bills and stubs on a sheet which is generally called a revenue control sheet. The number of bills duplicated on this sheet is limited to certain accounting districts or to arbitrary numbers of customers. When the prescribed number of entries are made the registers of the machine are totaled out on the sheet. All ledger stubs duplicated on the same sheet are then fastened together to make up a book. This book is totaled on a listing machine and this total checked against the revenue control sheet. The totals of the books make up the debit for the general ledger.

The revenue control sheet is proved by first checking all minimum bills and then multiplying the number of units of service used in each rate group by the respective rates and adding in the minimum bills. Proving is done on a key-drive calculator. Certain statistical information concerning production and sale of service may also be taken from the revenue control sheet. Proof of this sheet checks the accuracy of the operator in the use of the tables that serve as a source of the amounts entered on the bills.

When the customers pay their bills the cashier's stubs are detached and retained by the cashier. The bills are then receipted and returned to the customers. The cashier's stubs are totaled at the end of the day and these totals used in

proving cash. The stubs are then turned over to the accounting department where they are matched against ledger stubs. When a cashier's stub is matched against a ledger stub the latter is removed from the book. All stubs removed from the same book are then totaled and this amount credited to the control account. The stubs may then be filed or discarded, according to the practices of the particular firm. The receivables account is left with only the uncollected balance at all times. To prove receivables it is only necessary to total the stubs remaining in the books and match these figures agains the controls.

This system simplifies the record keeping and saves filing space. The customer's bill is approximately 3" x 5" and the stubs 3" x 2½".

It will be noted that no posting operations are necessary once the bills and stubs have been printed or the entries made. Checking is simplified by matching cashier's stubs and ledger stubs. All figures are proved before bills are mailed out. The plan works very well where it is expected that the receivables will be quickly paid as in the case of utilities.

Billing-Bookkeeping Machines. All wholesale and retail establishments using bookkeeping-billing machines use them to keep accounts receivable ledgers. The limited function and full-service wholesalers using this type of equipment also keep accounts payable on it. All these users make use of collated forms. Thus it is possible to print customer's bill, customer's ledger sheet, and write the journals at the same time; and to write the creditor's ledger sheet, jorunals, and payments con-

trol at the same time in keeping accounts payable on billing-bookkeeping machines.

The gas company uses a billing-bookkeeping machine in preparing the payroll. Information is taken from the gang time time sheets and the columnar record printed simultaneously with the checks. The total of the payroll sheet is the basis for the check voucher.

The Board of Education uses this class of equipment for keeping the appropriations ledger and for writing the claims liquidations payroll. Bookkeeping-billing machines seem especially well adapted to keeping appropriations ledgers. It is possible to write an explanation, to deduct encumberances and liquidations and print the unexpended and unencumbered balances with these machines.

The state auditor uses bookkeeping machines for keeping appropriations ledgers. Controls are maintained by means of dual-register listing machines against which accumulations must check.

The income Tax Collections Division of the Oklahoma Tax Commission uses bookkeeping-billing equipment to keep collections records. By means of spot carbons the tax receipt and collections record are printed simultaneously.

Key-Drive Calculators. Practically every type of business enterprise in the sample use key-drive equipment for a part of its figure work. The applications of this type of equipment are extremely varied. Some discussion by kinds of business seems to be called for.

The dairy products company uses key-drive machines for milk-purchase control, milk analysis, and to distribute operating costs by products and by dollar sales. A peg board is used in making the distributions.

The general merchandise group use key-drive machines to figure cost by departments, distribute sales by salesmen and by departments, figuring payrolls, distribution of payroll costs, figuring eastern invoices, ledger control, figuring commissions and mark-up, etc.

In the automotive group, the manufacturer's regional sales office uses four key-drive machines in the costing department. The figures originate from the posting media and the work consists of costing parts invoices. Different operators calculate the original invoice, the duplicate, and the shipping ticket. Monthly totals of invoices by dealers are added on the adding-listing machine. Two other machines are used in the analytical and statistical departments. Their work consists of checking the profitability of different brands; a work highly important to the business management department. Revenue, costs, etc. are proved each month by these same operators.

The lumber dealers use key-drive calculators in calculating and checking sales tickets, reports, inventories, and for general accounting work. Some costing and cost distribution is also done on these machines.

The drug store chain uses its key-drive calculators for figuring sales distributions by lines and by stores, costing merchandise, and for figuring payroll. This includes wages

and salaries at base pay, social-security and unemployment compensation deductions, other deductions, and net amount for each employee, and finally, proof of payroll.

The amusement chain uses key-drive calculators for consolidating reports from the eighty-four units of the chain. This includes per cent distribution of cost, combined earnings and costs for the entire chain by the month and for the fiscal period. There are eighty classifications in the distributions.

The stationery and office supply house uses its key-drive calculators to classify sales by salesmen and by territory, to calculate sales by cost, and by dollar volume, distribution of overhead and adding shop tickets in the printing department, and for all general figure work.

Allethe wholesalers listed in Table V use key-drive calculators to figure invoices and to check in-coming invoices. One firm extends orders at both cost and selling price. Another uses key-drive calculators to "spread", or distribute shipping cost on dollar basis, and distribute overhead on exceptional weight items. Other uses made of key-drive machines by this group include expense distribution on the basis of per cent of sales, figuring payroll, quarterly physical inventory on retail outlets, cash control, over and short accumulation and balance, and balancing ledgers which are kept by hand.

The steel and iron works uses key-drive calculators for figuring estimates, cost distribution by job cost, figuring payrolls, and general ledger balancing.

The packing plant uses fifteen key-drive calculators in the accounting department to handle all routine work. This includes calculating killed-weight cost, shrinkage loss, process cost distribution, extending and proving sales invoices, and statistical records relating to plant operation.

The mill & elevator uses eleven key-drive machines in a battery arrangement. All work clears across the desk of one operator. The work includes calculating invoices, grain settlements, inventory, and payroll. Invoices are made up on the typewriter. Twelve copies are made by use of one-time carbons. Grain settlements are written in indelible pencil with two carbon copies by means of one-time carbons. All the calculations such as converting weight to bushels, making deductions as shown on the inspection report, and figuring interest on the claim are made on the key-drive calculator.

The oil company offices use key-drive calculators for making daily sales recapitulations. The media used are the bulk station reports. One of the companies uses key-drive equipment for the extending of invoices and earnings by station, prorating expenses by station, and calculating sales and merchandise cost.

The bus line listed under transportation units uses key-drive machines in figuring bank control, payroll, revenue accounting, and in making audits. The street railway uses key-drive equipment for the same purposes.

The commercial bank uses key-drive calculators for adding transit letters, checking proof sheets, distributing costs

calculating revenue by departments, figuring payroll, and for general checking of other figures.

The telephone company uses key-drive equipment in two divisions of its accounting office. The payroll division handles all paying. Calculators are used to check invoices, to prorate overhead, general engineering and occupancy expenses, and for general checking purposes.

The receivable division of the telephone company uses forty key-drive calculators to calculators to figure toll costs and application of federal and state taxes.

The electric company uses key-drive machines to add unpaid bills stubs to arrive at the amount receivable, to prove the abstracts of revenue from the billing machines, to figure demand rates for commercial and large accounts, and for adding and proving the general ledger.

The gas company uses key-drive equipment in its billing department to calculate the flow of gas charts which make up the basis for the vouchers and billing. The treasurer's secretary uses key-drive equipment to prove checks to producers against flow of gas, and to check all in-coming and out-going papers to catch errors. General accounting uses this type of equipment to calculate original papers as a basis for charges to the general ledger from construction, repair, fixed capital, and transportation departments. Another use made of this type of equipment is to check all papers going through the department. The statistical and audit department uses key-drive machines to make the final audit on statements.

The state auditor is the only government office listed that uses key-drive equipment. The work consists of proving all incoming claims. These papers then become the media for the bookkeeping machines.

In summary, it has been found that multiplication on the key-drive calculator is used in the following operations:

1. proving invoices
2. distribution by percentages
3. figuring payroll
4. figuring inventories
5. conversion between different units (weight to bu. etc.)

Division is used in determining rates of per cent.

Addition is used in:

1. figuring invoices,
2. totaling distributions
3. adding payrolls
4. figuring inventories

Subtraction is used in making direct deductions of all kinds.

Crank-Drive Calculators. Crank-drive calculators are used for making distributions, for analyzing for source of profit, for making chain discount deductions, cost computations, and practically all kinds of business calculations. The following discussion shows how the types of businesses listed in Table V apply this machine to their figure work.

The dairy products company uses its crank-drive calculator at peak-load times to calculate butter fat content of milk purchased. It is also used on general figure work.

The two department stores use the crank-drive machines in costing merchandise, and for certain statistical work involving studies of tax application, occupancy expense, and analy-

sis of source of profits. The variety chain uses a crank-drive calculator to figure percentages on financial statements.

The crank-drive equipment owned by the lumber companies is used to figure chain discounts on purchases, figure interest for loan records, and occasionally on re-invoicing.

The retail drug chain uses crank-drive equipment for figuring percentages, some pricing work, some pro-rating expenses, and general figure work about the office.

The work done on crank-drive calculators by the wholesale houses includes figuring percentages on financial statements, some pricing, some cost distribution, and general utility.

The steel and iron works uses a crank-drive calculator to figure cost distributions and for a general office machine to suppliment other machine equipment.

The packing plant uses crank-drive calculators in figuring cost of products. They distribute direct labor, burden, waste loses, and on-the-hoof prices.

The grain elevator uses eighteen crank-drive calculators for figuring grain records and settlements; payrolls and tax returns; statistical work involving deliveries by classifications to customers; some invoicing; calculating payments (voucher clerk); figuring grain used and products packed out from grain (production records); for analyzing source of profit; and by the city sales office to figure intangibles, mill-feed, yield, and invoices; by traffic department in computing freight rates and payments.

The oil companies use crank-drive machines to calculate earnings by stations, extend invoices, prorate expenses by station, and to compute sales and merchandise cost.

The transportation units use crank-drive machines for figuring tax returns; on some revenue figures; and for general office use.

The telephone company uses its crank-drive equipment for some special statistical calculations, but mainly as a general utility machine not assigned to any particular operator.

The gas company uses crank-drive equipment in making tax studies, to set up tax accruals, to figure depreciation and depletion, and compiling unit cost for financial statements.

Among the government offices that use crank-drive calculators, the Oklahoma City Board of Education uses one in the auditor's office to check amounts from appropriations and to adjust encumberances. The State auditor uses one in figuring ad-valorem break-down for delinquent tax collections. Such collections are under old tax laws and are somewhat infrequent.

In Summary, it is noted that crank-drive calculators are used for the following purposes:

1. calculating per cent
2. figuring and deducting chain discounts
3. to calculate and analyze earnings;
4. general utility
5. costing merchandise
6. making cost distributions
7. cost and profit analysis

With the exception of a few highly specialized uses, notably in the grain business, the crank-drive calculator is a general utility machine, used to do various calculations about the office.

Comparison and Summary of Machine Usage

A comparison of the most frequent uses of the various classes of machine equipment will be of material assistance in determining content for a machine training program for Oklahoma City public high schools. Such a comparison will now be presented.

Adding-Listing Machines. Adding-listing machines are used most frequently for:

1. adding lists of figures that should be checked back;
2. general utility, consisting mostly of short additions for which an accurate total is wanted, especially where workers are not trained to use other kinds of equipment;
3. wide-carriage machines for writing payroll and check registers and similar work;
4. dual-register machines to accumulate totals of parallel items.

Posting Machines. Posting machines are used more frequently than other equipment for making entries on stub-ledger bills and stubs and for simultaneous writing of payroll checks and payroll sheet. They are also used for posting subsidiary ledgers, but in somewhat less numbers than billing-bookkeeping machines.

Billing-Bookkeeping Machines. Billing-bookkeeping machines are used more frequently than other types of equipment for:

1. posting subsidiary ledgers
2. posting appropriations ledgers.

Getting out customers' statements constitutes a frequent use for this class of equipment. This is often done as the ledger is posted by use of collated forms. However, some users do not

use collated forms but get out the statements at the end of the month as a summary of purchases and payments for the month. Invoicing, sometimes called billing, is done to some extent by wholesalers on this class of equipment.

Key-Drive Calculators. Key-drive calculators are applied to a wider variety of uses than any other class of machine equipment. Important uses of key-drive machines include:

1. calculating and proving invoices, involving addition, multiplication, and accumulation across a fixed decimal point.
2. distributions, whether of costs or incomes, involving multiplication by rates of per cent for making distributions and addition to a square total for proof.
3. figuring inventories, multiplying units by price and adding with accumulative proof.
4. figuring payrolls, involving multiplication of rates by hours, subtracting deductions, adding for total, and square total proof.
5. balancing general ledgers, consisting mostly of addition.
6. making audits, involving mostly multiplication and addition.

Numerous other special uses are made of this class of machine equipment but most such uses are shared with other classes of machines.

Crank-Drive Calculators. Crank-drive machines seem to be most frequently used for:

1. calculating rates of per cent
2. figuring chain discounts
3. analysis of earnings by yield in processing, especially in the grain business.
4. making tax applications, used generally in statistical studies.

Overlapping uses. The same kind of figure work is often done by different firms on key-drive and crank-drive machines.

Figuring rates of per cent, making cost distributions, and cost analyses are types of work that are done on both the key- and crank-drive calculators.

Posting machines and bookkeeping-billing machines both are used to post subsidiary ledgers. Posting machines are also used to some extent to write customers' statements, especially where front-feed posting machines are used.

Key-drive calculators in conjunction with typewriters overlap the use of bookkeeping-billing machines for invoice writing and calculating.

Adding-listing machines are often used on jobs involving square totals which are also frequently calculated by key-drive calculators. Among these jobs are figuring payrolls, proving journal pages and totaling and balancing ledgers.

The preceding chapters have shown the extent and kind of use made of figuring machines. The next chapter is devoted to the development of a course of study which is recommended for use in Oklahoma City public high schools as a means of training boys and girls to do the kind of figuring machine work which they will be expected to do when they leave school and find employment.

CHAPTER IV

THE COURSE OF STUDY

Factors to Consider

Type of training to be offered. In preceding chapters evidence has been presented which indicates that a market exists in Oklahoma City for three distinct kinds of figuring machine skills. They are: expert skill on the key-drive calculator, ability to use the adding-listing machine effectively, and basic skill in operating all classes of figuring machines. The problem of devising a course of study to develop the various skills raises a number of important questions. In this connection, Katenkamp, writing in the May 1937 issue of the National Business Education Quarterly, says,

> Among the important problems arising from the introduction of office machines into the commercial curriculum are the selection of the content of the course of study and the determination of the degree to which skill thereon should be developed.
>
> . . . . . The office machines course in neither "consumer knowledge" nor "personal use education."[7]

In other words, the problem is first one of deciding whether the three kinds of skills mentioned above are to be developed, or only one or two. If not all three, then what skill is to be omitted and to what extent shall the ones included be developed. These questions must be answered on some other basis than market for skills for the market exists for all three.

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7 Katenkamp, C. H. "The Content and Standards of Achievement for Calculating Machine Training," National Business Education Quarterly, May 1937, p 23

Some consideration must be given to the factors which will influence the type of training to be offered not connected with the market for the trained operator. Among these factors are: the amount of equipment that may be made available; the amount of time that may be devoted to the training program; and the means of selecting pupils for training, especially if expert skill is to be an objective.

If expert skill on the key-drive calculator is to be developed, the selection of pupils is of great importance. The Comptometer School frequently refuses to train applicants because, in the judgment of the school manager, it would be difficult or impossible to place them after they were trained. That school is also forced to eliminate some pupils after a few days work when it becomes apparent that the pupils lack aptitude for the work. Their attempts at prognosis of success through formal tests prior to enrollment have not proved to be much help because the tests are not very reliable.

The matter of available equipment eliminates further consideration of offering a training program to develop expert skill on the key-drive calculator. Neither of the two high schools in Oklahoma City offering machine training have sufficient key-drive equipment to set up a successful training program on the expert level. Each school has four key-drive machines, and to devote these to training pupils as expert operators would prevent the machines being used to teach basic operating skills to a much larger group. Inasmuch as there is need for key-drive training on the basic skill level, the

concentration of available machines on an attempt to train expert operators cannot be justified.

The operation of adding-listing machines, at least on the understanding level, can and should be taught in the second semester of bookkeeping and continued in all advanced courses.

It is clear that for the present the public high schools in Oklahoma City must confine their training efforts to a general course. Since a market has been shown to exist for workers with basic machine operating skills, such a program will be highly effective in meeting the needs of the pupils if the content is such that proper kinds of skills are developed. The figure work done in the business community should furnish the materials for the training program. Barnhart says,

> Schools which teach the office machine course in order to acquire skill, shall also emphasize the functions of these machines in the complete business picture.[8]

The amount of machine equipment found in use in Oklahoma City indicates that all classes of figuring machine equipment should be included in the training program. The precise skills used in actual employment situations as reviewed in Chapter III are used for the skill development program which follows.

Place of the Training Program in the Curriculum. Work in the commercial departments of the public high schools of Oklahoma City is divided into three curriculums. These are:

1. The stenographic curriculum, emphasizing shorthand, transcription, and some use of voice-writing equipment;

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8 Barnhart, Wilbur S. "Office Machines and Business Education," National Business Education Quarterly, May 1938, p 44

2. The bookkeeping curriculum, requiring four semesters of bookkeeping, two semesters of commercial arithmetic and machine bookkeeping;

3. The retailing curriculum, requiring two semesters of cooperative retail selling and a series of related subjects.

On the basis of evidence presented in Chapters II and III it appears that figuring machine operators are a part of the accounting department personnel of the firms employing them. It was noted in Chapter II that a number of employers preferred applicants with an understanding of accounting principles and well grounded in arithmetic.

It is evident from the above that the figuring machine training program belongs in the bookkeeping curriculum and a place for it is already established in the machine bookkeeping course now required of bookkeeping majors.

Duration of the Training Program. The drill necessary to develop machine skills requires longer sustained effort than time will afford in the ordinary class recitation period. This is due in part to the time necessary to be spent in getting out materials and setting up machines at the beginning of the period and putting materials away at the end. Steele[9] recommended a class period for machine training of two hours in succession. A period of that length allows ample time for effective work between the time work may begin and the time it is necessary to put materials away at the close of the period.

A two-hour period each day five days a week for eighteen weeks totals 180 hours of class recitation. However, some

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9 Steele, Annabel K. Op. Cit. p. 64

losses must be expected from holidays, assemblies, etc. Only about 175 hours may be considered as available for actual instruction in an eighteen-week semester. This is sufficient time to develop basic skills of kinds most frequently used in business offices in Oklahoma City. For that reason, the course of study is planned for one semester of eighteen weeks.

Grade Placement. The figuring machines training course should be the final semester of the training program. That is, the pupil should not enroll for the machines training course until his last semester. It is a well known fact that there is a very rapid loss of skill of any kind during a period of disuse. If the time between the figuring machine training course and initial employment can be kept at a minimum there will be less effort necessary to revive the skills actually employed on the first job.

Relation to Other Courses in the Curriculum. Not only is it the aim of this course to develop certain basic skills which have been shown to be used by office workers in Oklahoma City, but the development of those skills is brought about through the introduction of materials which will supplement the instructional materials of the bookkeeping courses in such a way that the pupil can get a clearer picture of how bookkeeping principles are employed in business offices in Oklahoma City.

Plans by which Figuring Machine Training may be Taught. Three basic plans have been devised by which figuring machine training may be taught. These are:

1. The battery plan, a large number of units of the same kind are provided and the entire group takes instruction on the same kind of equipment at the same time.

2. The rotation plan, only one or two units of each kind of equipment are provided and pupils move from machine to machine as they complete the required work.

3. The integrated laboratory project method, a model office is set up and all work taught as a part of office routine.

A fourth plan is a composit of the battery and rotation plans. It has been adopted by many moderate-sized high schools. The instructional effort is more effective in the combination plan than in the simple rotation, but the disadvantage of the division of the instructor's attention is partially retained.

The battery plan has the advantage that the teacher's efforts are not divided between a number of very different kinds of work. It is also most efficient where skill on the expert level is to be developed. The one great disadvantage is that where a small group only is to be trained a large amount of equipment is standing idle while pupils are working on a different kind. The outlay for equipment to teach a single group is prohibitive.

The rotation plan has the advantage that it is possible to train a small group without an excessive outlay for machines. Its greatest disadvantage is that is impossible for the teacher to help more than one pupil at a time and other pupils must sit idle while waiting for help. Another difficulty is that very little flexibility of time pupils are on each machine is possilbe. If only one unit of each machine is available the entire group must change at the same time or the time for two

machines must be the same as for a single other in order to make it possible to shift pupils about without leaving the machines idle.

The integrated laboratory project method of teaching office practice is not efficient for teaching basic skills on figuring machines because not enough different kinds of businesses can be represented in the semester to get a wide coverage of uses. Also the complicated office organization necessary to give some kinds of training would be more difficult to set up and keep operating than the advantage that would be gained by the pupil from having worked in the office organization would merit.

A combination of battery and rotation plans where five or six units of each kind of equipment are available makes the best arrangement for schools the size of the major high schools in Oklahoma City when attempting to develop only basic skills. It affords ample time on each class of equipment to develop the desired degree of skill and makes the most effective use of the machine investment by keeping all equipment in use all the time.

General Objective

The development of proper objectives for a course of study is as important as the selection of content, for indeed, content may mean little or nothing without it contributes to the development of needed skills. Learning activities must be set up which will make possible the attainment of objectives.

There is considerable evidence that high degrees of skill are not needed by most beginning workers. Stern says,

> It is a fact that most concerns insist upon machine training in their own kind of work. Much of the intensive training received in the classroom is, therefore, unnecessary, but the proper foundation for such training is vital for success and promotion.

From the evidence which has been presented the general objective of this course of study may be stated as follows:

It is the aim of this course of study to develop a degree of skill in each of the frequent uses made of figuring machines in Oklahoma City (insofar as those uses do not involve expert skill) which will reduce or eliminate aukwardness in handling materials, and reduce wasteful hand motions that result from indecision in the operation of the machines themselves.

Specific objectives will be listed for each machine as it is taken up in the course of study. These objectives are based on the most frequent uses made of the machines in business houses in Oklahoma City.

Content

Full-keyboard adding-listing machines

Objectives:

1. To develop the habit of using the whole hand in keyboard operation and to eliminate the tendency to use only the index finger.

2. To teach pupils to handle the materials commonly associated with the general utility uses of the adding-listing machine.

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10 Stern, Albert "To What Extent Should Business Machines Be Taught?," Business Education World, November 1938, p 238

Materials:

Instructional materials supplied by various adding machine manufacturers.

Groups of checks and other small tickets.

Columnar journals and reports with handwritten figures.

Miscellaneous text books.

Learning procedures:

1. Pupil is to work on instructional materials arranged to simplify learning to finger the keyboard properly until common figure combinations can be depressed without hesitation. Pupil will also learn to operate motor bar or crank with a minimum of hand motion.

2. Pupil will add checks or other tickets until he can maintain a steady rate of operation without fumbling media.

3. Pupil will add from columnar journals or reports until he learns to keep his place on the copy and to write figures into the keyboard accurately.

4. Pupil will multiply until thoroughly familiar with the process of multiplying on the adding-listing machine.

Ten-Key adding-listing machines

Objectives:

1. To develop touch operation at a slow rate without hesitation.

2. To teach applications of the machine that are commonly associated with general utility uses.

Materials:

Instructional materials furnished by manufacturers of ten-key adding-listing machines.

Sets of loose media such as checks, tickets, or stubs.

Columnar reports to be checked and proved.

Various text books.

Learning procedures:

1. Pupil will add columns of figures arranged to facilitate learning touch operation until he no longer hesitates in making correct key reaches.

2. Pupil will add from loose media until he is able to handle the media and operate the keyboard without fumbling.

3. Pupil will add columnar reports and columnar journals until he is able to copy figures accurately without looking up from the copy; work to be proved by square total.

4. Pupil will multiply until he understands multiplication by successive addition and changing columns by adding ciphers.

Full-keyboard posting machines

Objectives:

1. To teach the efficient handling of ledger sheets, offsetting active accounts, and handling posting media.

2. To develop dexterity in fingering the keyboard.

3. To teach the principles of machine posting.

Materials:

A short set of posting media for preliminary training.

Longer sets of media for advanced training, consisting of:
(a) accounts receivable and payable for a retail store;
(b) accounts receivable for a wholesale house.

Ledger sheets and trays.

Learning procedures:

1. Pupil will become acquainted with the handling of ledger sheets and posting media in the preliminary set. Controlling account proof will be used because it is the simplest method of proof to learn.

2. Either longer set will be used to improve the pupil's ability to handle media and materials. Different methods of proof will also be taken up.

Ten-key posting machines

Objectives:

To teach posting by touch operation of the ten-key keyboard.

To teach collation and simultaneous printing of customer's statement and ledger sheet.

To teach various methods of proof.

Materials:

Collated ledger sheets and statements.

Posting media for two successive billing periods made up of accounts receivable for a retail store.

Trays for ledger sheets.

Learning procedures:

1. Pupil will learn to set up ledgers and the method of posting in the work of the first billing period. Various methods of proof will be introduced as the pupil is ready for them.

2. Pupil will learn to combine new statement sheets with old ledger sheets during second billing period. Additional methods of proof will be presented as pupil becomes more familiar with the work.

Billing-bookkeeping machines

Objectives:

To teach billing on the billing-bookkeeping machine.

To teach posting with typewritten explanations.

To teach posting with full collated form applications.

To teach posting of appropriations ledgers to those pupils interested in working out the municipal set.

Materials:

Invoice blanks and several sets of purchase orders for billing problems.

Sets of collated forms and ledger sheet trays.

Materials, continued:

Appropriation ledger sheets and journal proof sheets for use with municipal set.

Sets of:
(a) media for department store accounts receivable and accounts payable.
(b) media for wholesale accounts receivable.
(c) media for a municipal set.

Learning procedures:

1. Pupil will complete one short and one long billing problem.

2. Pupil will complete one of the three practice sets with the option of working one additional set. More work will be required of pupils not able to do accurate work by the end of the first set.

3. Pupil choosing municipal set will do work covering complete fiscal period on regular appropriations and on special authorizations.

Key-drive calculators

Objectives:

1. To teach the fundamentals of addition, multiplication, subtraction, and division.

2. To teach the method of proving invoices by accumulation across a fixed decimal point.

3. To teach the method of proving distributions by square totals.

4. To teach method of figuring rates of per cent.

Materials:

Various text books.

Sets of invoices to be calculated and proved.

Distribution sheets.

Answer sheets.

Learning procedures:

1. Pupil will work on addition until he can choose column by touch on at least three-column figures.

Learning procedures, continued:

1. Practice will emphasize steady rhythm. Multiplication will be introduced during the first few hours of practice and multiplication drills used to break the monotony of addition practice.

2. Pupil will work on subtraction until thoroughly familiar with the process. No definite speed will be required.

3. Timed drills will be given occasionally over all operations studied to encourage pupil to improve his techniques.

4. Division will be introduced with problems not involving index dials. As soon as pupil becomes familiar with the process problems involving index dials will be introduced. Division will be immediately applied to calculating rates of per cent.

5. Pupil will prove invoices by checking individual extensions, adding net amounts, then accumulating across a fixed decimal for proof of other calculations. Practice is to continue until pupil can perform all operations without hesitation.

6. Pupil will make distributions in given ratios and prove the sheets until he is able to perform all operations without any kind of assistance.

Crank-drive calculators

Objectives:

1. To teach the fundamentals of addition, multiplication, subtraction, and division.

2. To teach calculation across a fixed decimal point.

3. To teach the calculation of rates of per cent.

4. To teach deduction of successive discounts.

Materials:

Various text books.

Sets of invoices with successive discount items.

Answer sheets for recording answers.

Sets of financial statements on which ratios are to be calculated.

Learning procedures:

1. Pupil will add and subtract until he is familiar with the basic operation of the machine.

2. Pupil will do simple multiplication until he is able to make carriage shifts correctly and time the depression of motor bars accurately. Short-cut multiplication will be introduced as quickly as pupil is familiar with simple multiplication. As soon as the fundamentals of multiplication are learned all work will be done across a fixed decimal point.

3. Pupil will learn division across a fixed decimal point; as soon as the process is learned it will be applied to calculating rates of per cent.

4. Pupil will learn to deduct successive discounts by subtractive multiplication. Practice will be continued until pupil can set up problems and calculate the answers without having to stop and think out each step.

Testing

Adding-listing machine work will be tested by checking the production rate during one of the last hours the pupil works on the machine. This will be done without announcing that a check is being made.

A similar procedure will be followed in checking the effectiveness of posting machine and billing-bookkeeping machine training. The number of entries made in an hour and the time necessary to complete a given block of work will be checked. The pupil is not to know a check is being made.

The testing program for the key- and crank-drive calculators will be taken from the timed review drills interspersed through the days the pupil works on each machine. The pupil will be told that some of the drills are to be checked for rate, but not which ones.

The objectives as set forth do not call for any particular degree of skill. For that reason the tests will be rated relative until such a time as better criteria are available for specific rates of performance. The market this training is directed to is not accustomed to trained operators so that experience will be necessary to build up rates of performance aganst which testing programs may be checked. Such information will have to come through follow-up studies which implies that placement must follow training.

Grading

The basis for grades will be the points earned in the operation of the machines. Each block of work will have to be rated on the basis of machine operations involved.

Grades will be calculated for each different class of machine equipment in order to avoid the difficult problem of weighting machine operations on the various machines on a common scale.

Test grades will be comparative and weighted one-fourth in arriving at the pupil's grade on a particular machine.

Extra time spent after school and during vacant periods will increase the pupil's grade by increasing the number of points he earns on the particular piece of equipment he works on during the spare time.

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This article is a discussion of the problems involved in teaching specialized training for skill and training in fundamental skills.

APPENDIX

Make of machine	Auxilliary Equipment	No. of parallel units	Nature or source of media	Nature of calculation Type	Size of factors A	B	C	Frequency of occurrence	How recorded	Use made of record	Relationship to other figure work	

TABLE I

Status of Commercial Banks in Oklahoma City
at Close of Business June 30, 1938

BANK	Capital	Loans and Discounts	Deposits	Surplus and Profits	Cash from Banks	Bonds and Stocks
With reserves of other banks						
City National Bank and Trust Co.	200,000	1,669,020	5,973,972	283,845	2,267,650	2,341,702
Fidelity National Bank	450,000	982,819	7,027,321	307,474	2,419,345	3,346,129
First National Bank and Trust Co.	5,000,000	16,700,000	53,201,000	3,424,000	22,631,000	21,631,000
Liberty National Bank	1,200,000	6,862,300	20,099,727	969,289	9,949,828	5,085,112
Tradesmens National Bank	500,000	491,241	16,120,988	317,498	10,487,898	5,699,530
Total with Reserves of Other Banks	7,350,000	26,705,380	102,422,963	5,302,106	48,755,721	38,103,473
Without reserves of other banks						
Oklahoma National Bank	100,000	340,975	1,413,523	48,632	609,875	583,418
Stock Yards National Bank	50,000	296,697	1,032,560	26,974	557,835	254,824
Total without reserves of other banks	150,000	637,672	2,446,083	75,606	1,167,710	838,242
GRAND TOTAL	7,500,000	27,343,052	104,369,046	5,377,712	49,923,431	38,941,715

NOTE: this table should be read as follows; The City National Bank and Trust Co. is capitalized at $ 200,000, held notes and other commercial paper in the amount of $ 1,669,020, had total deposits of $ 5,973,972, had $ 283,845 in the surplus account, etc.