MACHINE METHODS OF ACCOUNTING

ELECTRIC ACCOUNTING MACHINES

(Type 285 and Type 297)

SEVERAL distinctive features of outstanding importance have been incorporated in the new models of International Electric Bookkeeping and Accounting Machines which enhance their general utility and increase the field for their application.
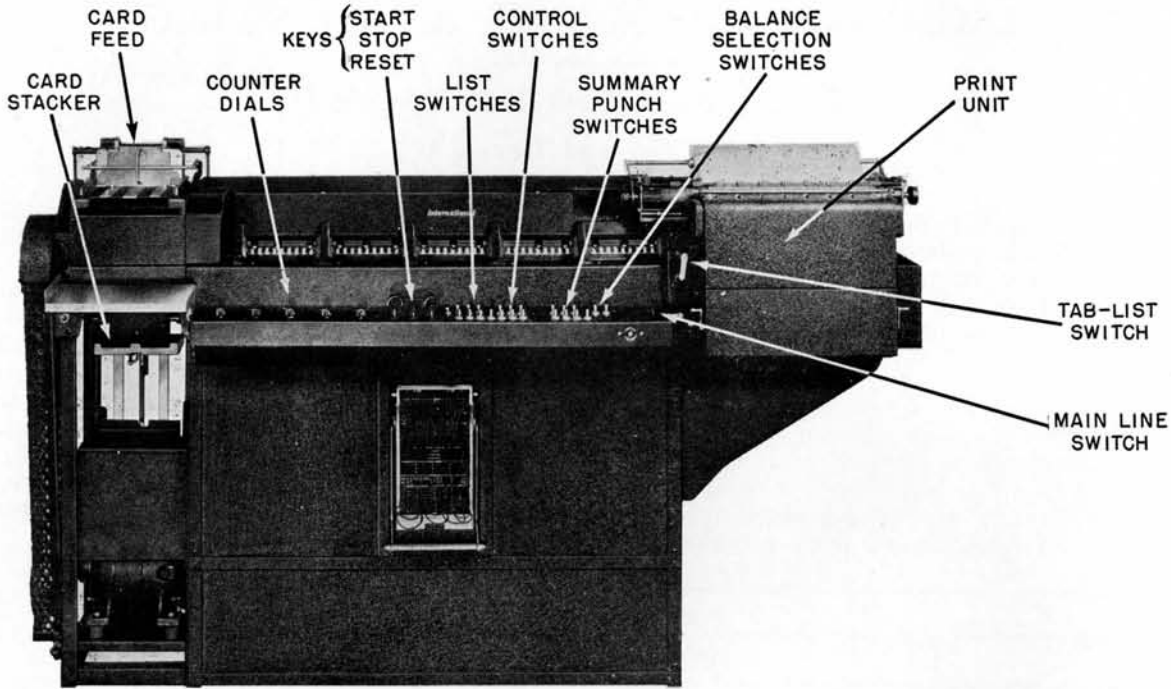
The preparation of numerous and varied documentary records—in addition to the tabulation of accounting reports and statistical analyses which were formerly the chief function of the Electric Accounting Machines—accompanied the adoption of such mechanisms as the Controlled Counter, Balance Printing, and the Automatic Plugboard.
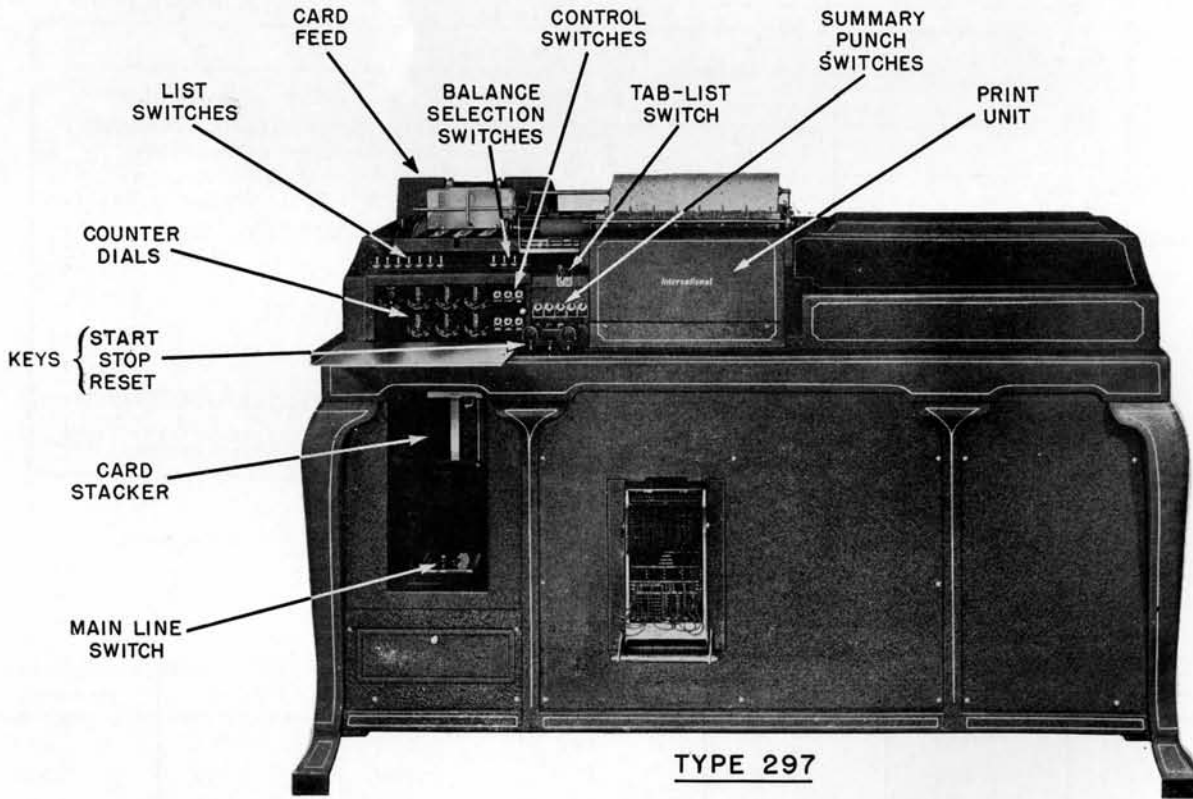
One of the most important developments is the Controlled Counter. This unit is so constructed that amounts appearing in a single field of a group of cards may be added, subtracted, or eliminated in the accumulation of net totals. This control is effected for each individual card as it enters the machine. For example, a file of inventory cards containing a single quantity field may be tabulated to obtain the inventory report shown below.

CONTROL OF STOCK						
COMMODITY NO.	MAXIMUM REQUIRED	MINIMUM REQUIRED	BEGIN BALANCE	RECEIVED	DISBURSED	NEW BALANCE
24972	350	300	200	260	75	385
24973	2000	1500	500	1800	1000	1300
24974	900	600	750	1445	370	1825
24975	1200	1000	1100	800	1050	850

CARD
FEED

CARD
STACKER

COUNTER
DIALS

KEYS {START
STOP
RESET

LIST
SWITCHES

CONTROL
SWITCHES

SUMMARY
PUNCH
SWITCHES

BALANCE
SELECTION
SWITCHES

PRINT
UNIT

TAB-LIST
SWITCH

MAIN LINE
SWITCH

TYPE 285

CARD
FEED

CONTROL
SWITCHES

SUMMARY
PUNCH
SWITCHES

LIST
SWITCHES

BALANCE
SELECTION
SWITCHES

TAB-LIST
SWITCH

PRINT
UNIT

COUNTER
DIALS

KEYS {START
STOP
RESET

CARD
STACKER

MAIN LINE
SWITCH

TYPE 297

DUPLICATE	STATEMENT				JONAS & SMITH BRIDGEPORT CONN			CODE 1 INVOICE 2 CASH RECEIPT 3 DEBIT MEMO 4 CREDIT MEMO	

NAME W. S. Allen
ADDRESS 412 26th St.
New York, N. Y.

No. 13

DATE March 1 193____

| CREDIT LIMIT	CUSTOMER NUMBER	DATE			INVOICE OR REFERENCE NO.	CODE	DEBIT OR CREDIT AMOUNT		BALANCE
		MONTH	DAY	YEAR					
2000	13								
	13	11	06	36	1273	1	200	00	
	13	11	14	36	1084	4	68	00 CR	
	13	1	28	37	1506	1	954	60	
	13	1	29	37	1527	1	654	32	
	13	1	29	37	1273	2	200	00 CR	
	13	2	10	37	1743	1	540	25	
	13	2	15	37	1506	2	954	60 CR	
								1126	57 *

The machine is further equipped with a special printing control to permit the recording of debit and credit amounts in true figures with an appropriate designating symbol. It is customary to designate only one class of items (such as negative balances) when listing and total printing. The operation of this feature is shown in the accompanying Accounts Receivable statement.

The other important feature is the Automatic Plugboard. By means of the Automatic Plugboard, these machines are arranged to read the proper card columns, print in the required positions, and perform all necessary functions required for any report. These removable plugboards are available in two types—one permanently wired, and the other subject to manual change by the insertion or removal of connecting plugwires. They combine the important advantages of complete flexibility in operation, and a minimum loss of machine time between operations.

*   *   *   *

Type 285 and Type 297 Electric Bookkeeping and Accounting Machines are similar in all principles of operation; but differ in appearance and capacity. Both types are numerical printers, are capable of direct subtraction, use the same automatic plugboard, and can be equipped with Automatic Summary Punches.
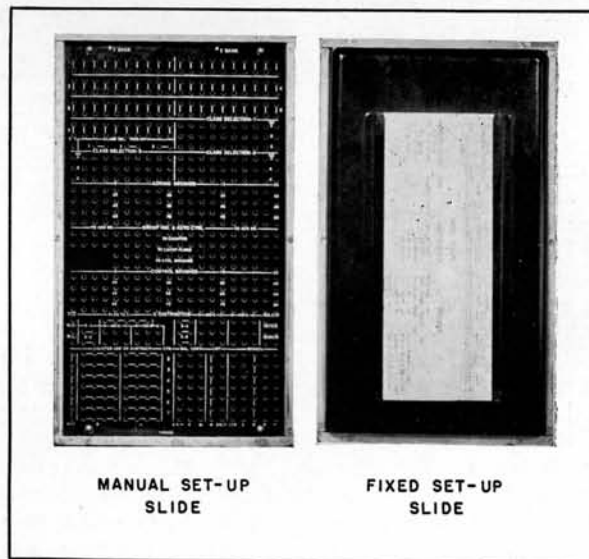
MANUAL SET-UP SLIDE   FIXED SET-UP SLIDE

Functions

For convenient reference during the description of the different functions of these machines, it is desirable to define at the outset certain terms which are hereafter used without explanation.

"Automatic control" is a function by means of which a machine automatically distinguishes the cards of one classification from those of another, and causes the proper totals to be printed for each classification. The cards in a single classification are hereafter referred to collectively as a "control group."

The machine, through the use of two sets of brushes, matches the holes in the control field of one card with those in the succeeding card and if they are in agreement, that is, if the cards belong to the same group, the machine will continue to feed automatically. When the holes in the card passing the upper or control brushes fail to agree with those in the card passing the lower or adding brushes, the machine will stop and automatically print the totals for the group, clear the counters, and then continue with the next group.

"Listing" is the printing of information from each individual card as it passes through the reading unit of the machine. A card can be listed only during a "list" cycle, which involves synchronous operation of reading and printing units. When a machine is set to LIST by positioning the Tab-List lever located on the left of the printing mechanism, every card-feeding cycle is a list cycle. Information in the cards can be accumulated during the listing operation and the totals so obtained can be printed as required.

"Tabulating" is the accumulation of information from the cards without listing them individually. When a machine is set to TABULATE by placing the Tab-List lever in that position, the first card-feeding cycle of each control group is a list cycle, but the remaining card cycles of that control group are tabulating cycles, during which the printing unit remains inoperative until the last card of a group has been read. Thereupon desired group totals may be printed automatically. The initial list cycle for each group makes it possible to list the classification from the first card, for identification of the total of the group, printed subsequently.

The *"Printing Unit"* consists of a series of type bars each of which contains numerical characters from 0 to 9 or symbol type. These bars are mounted in a separate unit which operates whether listing or total-printing is to be performed. In a seven-bank machine there are seven banks of type, each having ten printing bars. An asterisk bar is used to print a credit or total symbol beside the transcribed amounts.

The printing unit is so arranged that zeros print automatically to the right of any figure but not to the left of a figure. This is accomplished by a mechanism known as the "zero pawl assembly." When a significant figure appears in any other than the units position, the zero pawl assembly will automatically stop all the type bars to the right of the significant figure at zero and cause the printing of zeros in every type bar to the right of the figure—provided no character from 1 to 9 is to be printed in those positions.

The *"Carriage"* on all Electric Bookkeeping and Accounting Machines is similar to a typewriter carriage. It effects standard vertical spacing of six lines to the inch when single spacing, and three lines to the inch when double spacing. It is arranged to accommodate a sheet of paper twenty inches in width.

Each time the type bars rise, the platen is advanced one space. This action may effect double spacing by adjusting the position of the space control lever at the side of the platen.

In addition to these general preliminary descriptions of functions that are characteristic of tabulating machines generally, the major functions of the Electric Bookkeeping and Accounting Machines (Types 285 and 297) are more fully described in the following paragraphs.

Listing

There are two kinds of print banks—"list banks" and "counter banks." List banks are capable of listing only, while counter banks can both list and total print. Certain models of these machines are equipped with list banks, which provide additional listing capacity and make it possible to use the counter banks exclusively for total printing.

A typical example of the plugging required for listing in a list bank is shown in the figure below. Individual plug-wires are inserted to connect the outlets of the "Adding Brushes" to the type bar positions.

Each list bank is provided with a List Switch by means of which, when a machine is set to LIST, that bank can be caused either to list every card, or to list only the first card of each control group. When a machine is set to TABULATE, only the first card of each control group can be listed, regardless of the position of the List Switch.

The plugging required for listing in counter banks is identical with that required for the accumulation of the same information in their respective counters, and is explained in the description of the different kinds of accumulation. Information cannot be listed in counter banks without being accumulated in their counters, but information accumulated in the counters may be listed if desired.

Listing in counter banks is ordinarily required only when a machine is set to LIST every card. In this case, after the counters have been plugged, it is necessary only to turn on the corresponding List Switches. When a machine is set to TABULATE, only the first card in each control group can be listed in a counter bank. In this case, accumulation in the corresponding counter must also be limited to the first card, by means of the "group indicator," which is described in a later section.
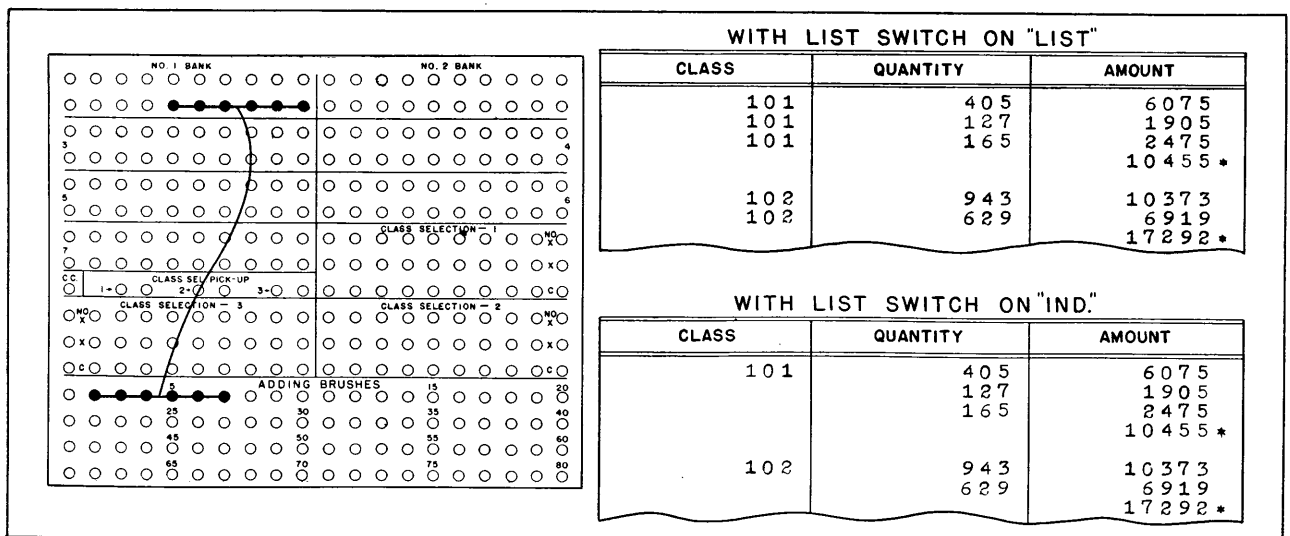
In counter banks connected to "balance counters," both added and subtracted amounts are ordinarily listed when the List Switches are turned ON. Subtracted amounts are listed just as they are punched (i.e. without conversion) and are automatically identified as credits by the symbol "CR." The listing of subtracted amounts can be suppressed if necessary, without interfering with the listing of added amounts, by plugging together the two "List + only" hubs of the balance counter involved. An example of this plugging is shown in the lower right corner of the plugboard in the "Wiring for Addition" diagram. The report shown at the right, however, does not reflect this wiring, because the setting of switches made the listing feature inoperative.

Accumulation

Information punched in individual cards is accumulated in counters, of which there are two kinds—"adding counters" and "balance counters." Machines are available with adding counters only, with balance counters only, or with a combination of both.

Adding counters can only add, but differences can be obtained by punching in complement those amounts to be deducted. The addition of these complements reduces the counter balance, and accomplishes the same results as though these amounts had been subtracted.
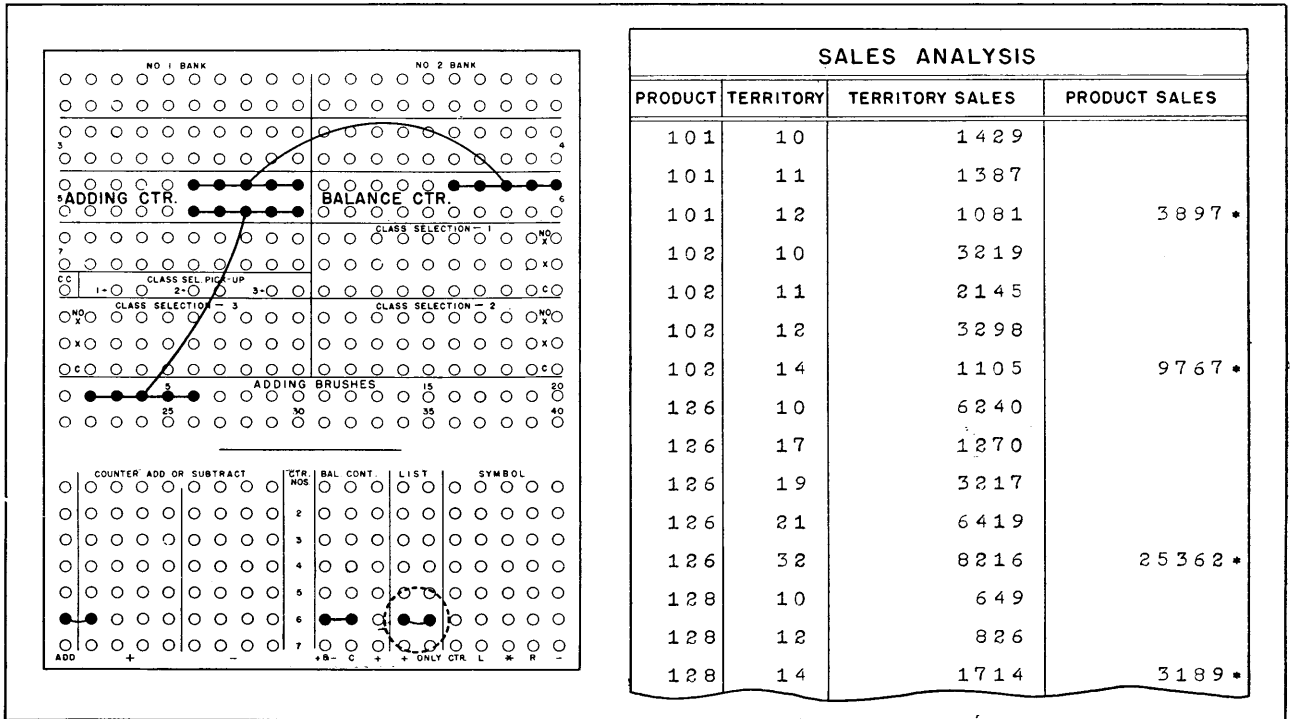
Balance counters can either add or subtract amounts, and therefore make the punching of complements unnecessary. A negative balance appears as a complement in a counter but such

WITH LIST SWITCH ON "LIST"		
CLASS	QUANTITY	AMOUNT
1 0 1	4 0 5	6 0 7 5
1 0 1	1 2 7	1 9 0 5
1 0 1	1 6 5	2 4 7 5
		1 0 4 5 5 *
1 0 2	9 4 3	1 0 3 7 3
1 0 2	6 2 9	6 9 1 9
		1 7 2 9 2 *

WITH LIST SWITCH ON "IND."		
CLASS	QUANTITY	AMOUNT
1 0 1	4 0 5	6 0 7 5
	1 2 7	1 9 0 5
	1 6 5	2 4 7 5
		1 0 4 5 5 *
1 0 2	9 4 3	1 0 3 7 3
	6 2 9	6 9 1 9
		1 7 2 9 2 *

Wiring For Listing

NO. 1 BANK
NO. 2 BANK

3
4

5
6

CLASS SELECTION — 1
7
NO X
x
C.C.
CLASS SEL. PICK-UP
1→ 2→ 3→
C

NO X
CLASS SELECTION — 3
CLASS SELECTION — 2
NO X
x
x
C
C

5
ADDING BRUSHES
15
20
25
30
35
40
45
50
55
60
65
70
75
80

TO ADD BR.
GROUP IND. & AUTO. CTRL.
TO ADD BR.
TO COUNTER
TO SHUNT PLUGS
TO CTRL. BRUSHES

5
CONTROL BRUSHES
15
20
25
30
35
40
45
50
55
60
65
70
75
80

TCC
PLUG TO C
X - DISTRIBUTOR
X NO-X C
X NO-X C
MAJOR
M(U)
X-1
X NO-X C
X NO-X C
X-4
INTER
M(L)
X-2
X-5
MINOR

COUNTER ADD OR SUBTRACT
CTR. NOS.
BAL. CONT.
LIST
SYMBOL

2

3

4

5

6

7

ADD   +   −   +&− C   +   + ONLY CTR. L   *   R   −

SALES ANALYSIS			
PRODUCT	TERRITORY	TERRITORY SALES	PRODUCT SALES
101	10	1429	
101	11	1387	
101	12	1081	3897 *
102	10	3219	
102	11	2145	
102	12	3298	
102	14	1105	9767 *
126	10	6240	
126	17	1270	
126	19	3217	
126	21	6419	
126	32	8216	25362 *
128	10	649	
128	12	826	
128	14	1714	3189 *

Wiring For Addition

a balance may be printed as a true figure. Balance counters can therefore convert negative counter balances into true printed totals automatically.

"*Straight accumulation*" is defined as the accumulation of the same card fields in all cards. A typical example of the plugging of adding and balance counters for straight addition is shown in the diagram above.

In this example, both counters are plugged to add the same amounts, as required for simultaneous accumulation of "minor" and "major" totals. This is made possible by the common pair of hubs provided for each counter position, which permit successive plugging from the same adding brush to as many counter positions as may be necessary.

The connecting wire in the encircled section is not essential for the preparation of the report shown. It is only illustrative of the wiring for balance counter listing described previously.

In the same figure, it should be observed that the plugging of the balance counter includes the plugging of its "counter control." While adding counters are plugged only from the adding brushes, balance counters must also

be "controlled." That is, a balance counter can either add or subtract, and therefore must be actuated by means of plugging to do the one or the other. If it is not plugged to add or subtract, it ignores any impulses which may be received from the adding brushes.

In the example shown, the plugwire from an "add" hub, (which is a source of control impulses) to a "counter-add" hub of No. 6 counter, causes all cards to be added in that counter. If this same plugwire were plugged to a No. 6 "counter-subtract" hub instead, all cards would be subtracted. If this control plugging were omitted, nothing would be accumulated in No. 6 counter. The four hubs in each counter-add and counter-subtract group are common, to permit successive plugging of the same control impulse for simultaneous control of two or more balance counters.

Class Selection

"Class selection" is possible only in machines equipped with "class selectors" or with balance counters. As a general function it involves the control of accumulation or listing of information from each card individually. For this purpose, different classes of cards are distinguished by X-holes in different card columns. The presence or the absence of an X-punching
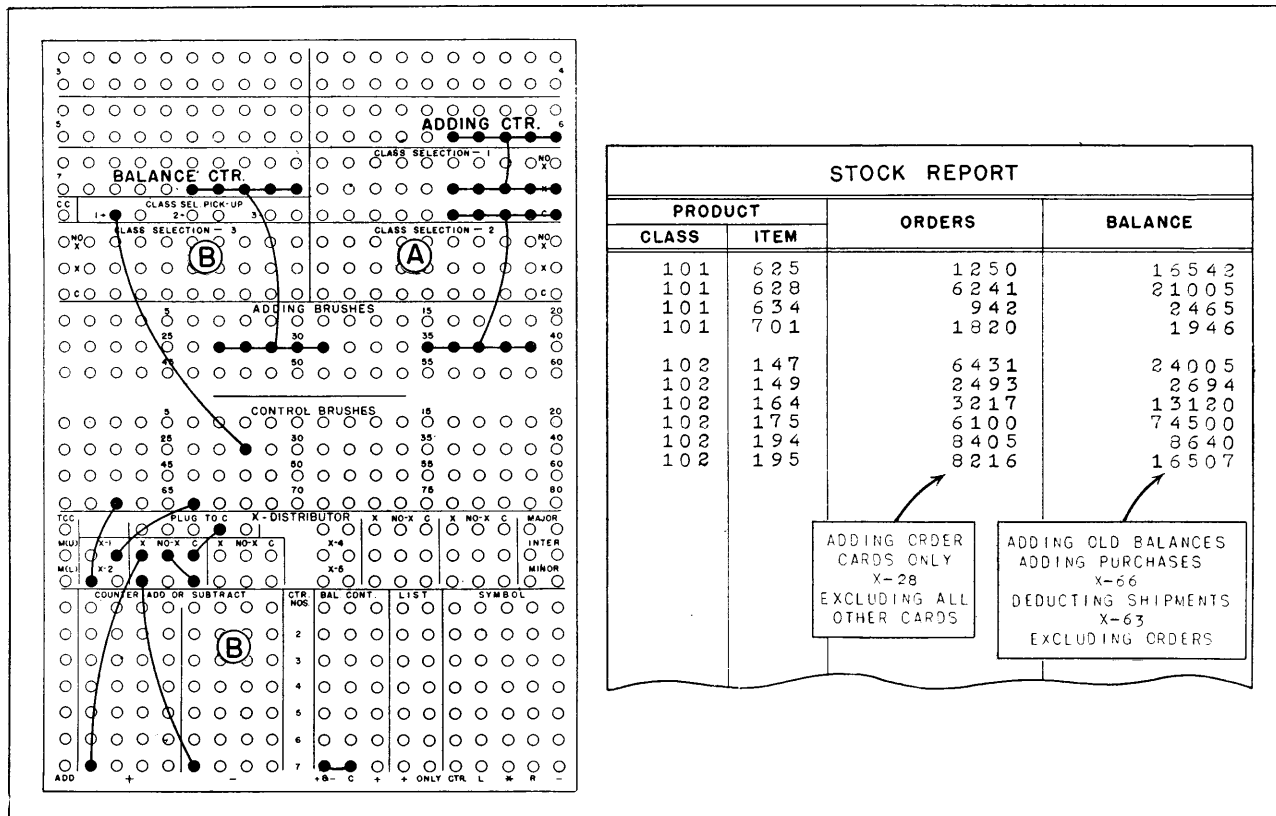
in a given column of a card automatically causes the machine to add, subtract, or ignore that card, or to add or subtract different fields in that card, as predetermined by the plugging for these purposes.

Through the use of this very simple but important feature it is possible to sub-divide or classify the cards in a group into components. For example, in a payroll analysis it is possible to separate the day-work and the piece-work amounts so that the total in one counter will be the day-work amount and the total in another counter the piece-work amount. Similarly it is possible to separate the productive and the non-productive labor, etc.

Class selection may properly perform any of three specific functions—"counter selection," "field selection," "field elimination." Counter selection is concerned with a particular card field, and involves the selection of the counters in which this field will be added or subtracted. Field selection or elimination is concerned with a particular counter, and involves the selection or elimination of the field of each card which is to be added or subtracted.

Counter Selection—In the case of adding counters, counter selection involves only the adding or ignoring of different classes of cards. In the case of balance counters, counter selection involves determination of whether a given class of cards will be added, subtracted, or ignored. Typical examples of counter selection in both adding and balance counters are shown in the following diagram.

In example A, class selector No. 1 is plugged to cause addition of X28 cards only, in No. 6 counter. The class selector is controlled for this purpose by plugging one of its two common "pick-up" hubs to the control brush for card column 28. This causes the selector to transmit the adding brush impulses to No. 6 counter only from X28 cards. If this counter were plugged from the "No-X" hubs of the selector instead of from the "X" hubs, all but X28 cards would be added. From this it follows that one counter could be plugged from the X hubs, and another counter from the No-X hubs, for simultaneous accumulation of separate totals of X28 and No-X28 cards.

STOCK REPORT			
PRODUCT		ORDERS	BALANCE
CLASS	ITEM		
1 0 1	6 2 5	1 2 5 0	1 6 5 4 2
1 0 1	6 2 8	6 2 4 1	2 1 0 0 5
1 0 1	6 3 4	9 4 2	2 4 6 5
1 0 1	7 0 1	1 8 2 0	1 9 4 6
1 0 2	1 4 7	6 4 3 1	2 4 0 0 5
1 0 2	1 4 9	2 4 9 3	2 6 9 4
1 0 2	1 6 4	3 2 1 7	1 3 1 2 0
1 0 2	1 7 5	6 1 0 0	7 4 5 0 0
1 0 2	1 9 4	8 4 0 5	8 6 4 0
1 0 2	1 9 5	8 2 1 6	1 6 5 0 7

ADDING ORDER CARDS ONLY X-28 EXCLUDING ALL OTHER CARDS

ADDING OLD BALANCES ADDING PURCHASES X-66 DEDUCTING SHIPMENTS X-63 EXCLUDING ORDERS

Methods of Wiring for Counter Selection

As shown in example B, counter selection involving balance counters is ordinarily accomplished by selecting the "counter control" impulses (instead of the adding brush impulses) for which purpose the "X-distributor" is provided. This unit consists of five "Plug to C" hubs, which are a source of control impulses, and five two-position class selectors. These small class selectors are also controlled by plugging their common pairs of "pick-up" hubs to the proper control brushes. In the example shown, No. 7 counter is plugged to add X66 cards, subtract X63 cards, and ignore all other cards. If a card is punched both X66 and X63, it will be added as though X66 only was punched. If neither X66 nor X63 is punched, no amount would be introduced into the counter.

It should be noted that each balance counter is controlled as a unit. The whole counter adds, subtracts, or does neither. If a balance counter is to be used for the simultaneous accumulation of more than one total (by splitting the counter), and counter selection is to affect only one of these totals, the desired results cannot be obtained by selection of counter control impulses. In this case the adding brushes involved must be plugged through a class selector just as required for an adding counter.

Field Selection—Field selection requires the use of class selectors regardless of the kind of counter involved. An example of the plugging necessary for selection of either of two card fields is shown in the illustration below.

In this example, all amounts are accumulated in No. 5 counter, but they are obtained from card columns 34-37 in X45 cards, and from card columns 30-33 in all other cards. If No. 5 counter were a balance counter, suitable counter control plugging would also be required.

Elimination — Classes of information which are to be omitted may be eliminated by means of the class selector as shown in example A of "Methods of Wiring for Counter Selection." The omission of wires from either the X or No-X outlets of a class selector results in the elimination of the corresponding classes of data.

Group Indication

"Group indication" is the identification of control-group totals by printing their group classifications. In a list bank, this can be accomplished only by listing the classification from the first card of the group. In a counter bank, group indication can be accomplished either by listing from the first card, or by adding the classification from the first card only, and later printing it as a total.

In a counter bank, group indication necessarily involves addition of the classification, regardless of whether it is listed or total printed, and this addition must be limited to the
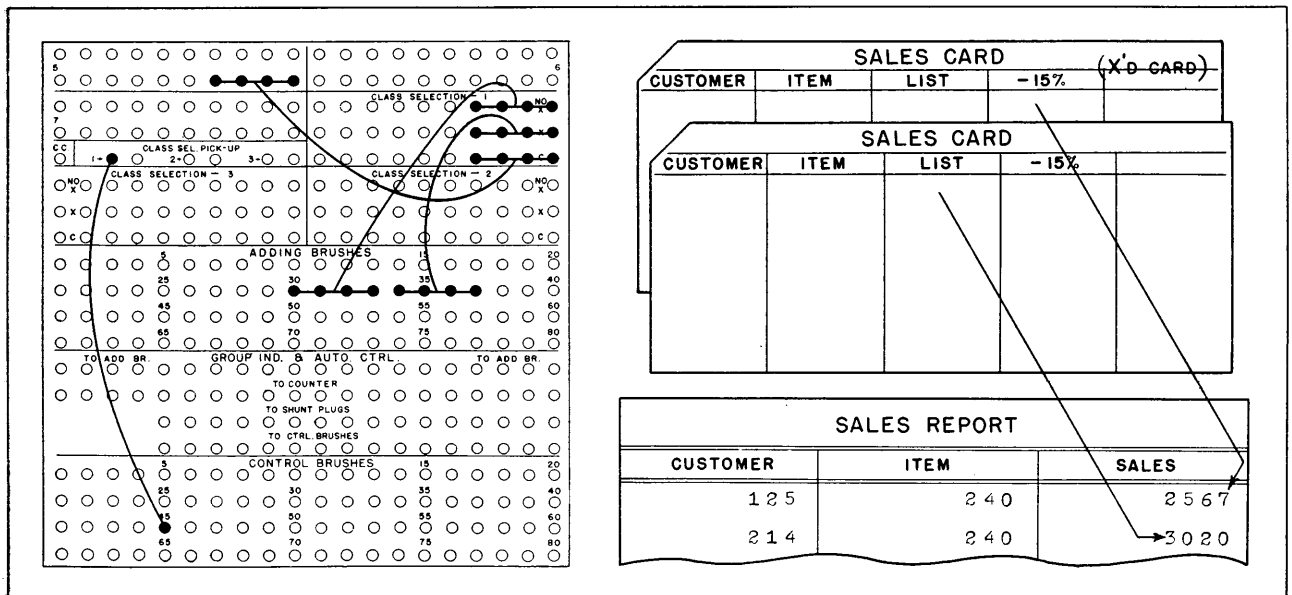
Wiring for Field Selection

first card of each control group in either case. This is accomplished by means of the "group indicator." Typical examples of plugging for group indication in both adding and balance counters are shown below.

As in example A, group indication in an adding counter bank requires that all adding brushes involved be plugged first to the group indicator and then to the counter hubs. As shown in example B, group indication in a balance counter may be simplified by plugging only the counter control impulses through the group indicator. However, as noted in the description of class selection, each balance counter is controlled as a single unit. If a balance counter is to be used for group indication and accumulation simultaneously, all adding brushes involved in the group indication must be plugged through the group indicator, just as required for adding counters.

When only group indication is involved, positions at the left side of the group indicator should be used, to avoid interference with the plugging required for automatic control. When the same adding brushes are employed for both group indication and automatic control, they should be plugged to the right side of the automatic control unit as require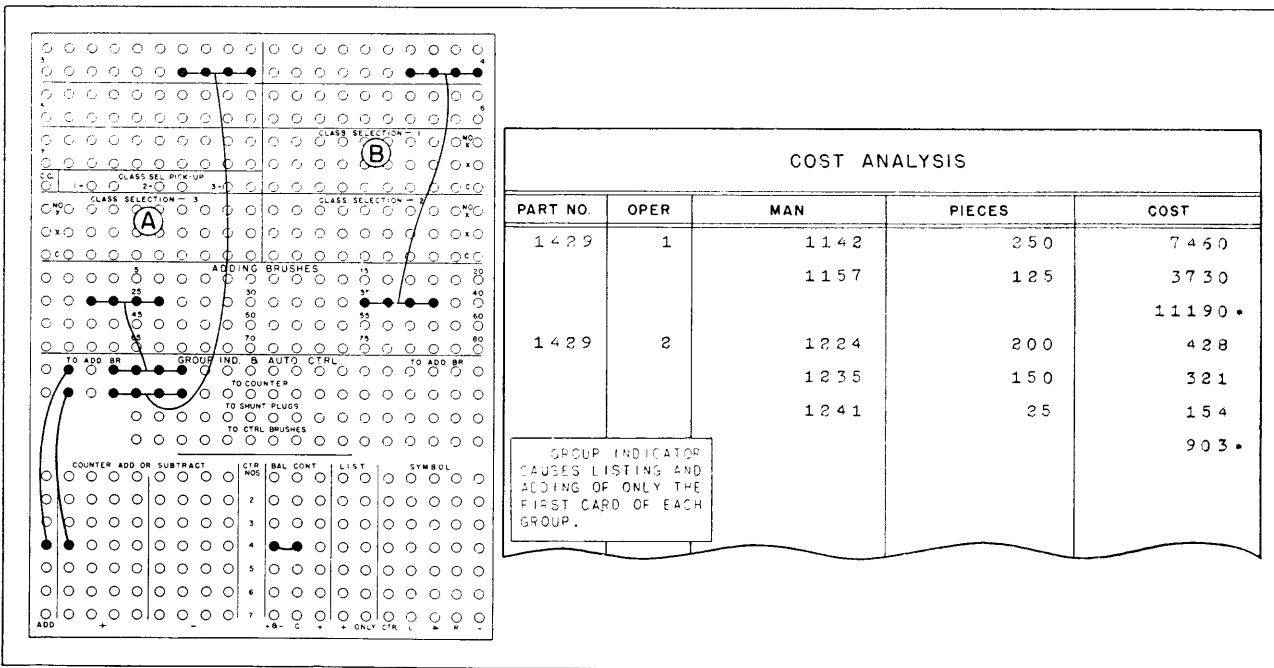d for automatic control, and the counters plugged from the hubs immediately below. The hubs designated "To Add Br" are common to both the group indicator and the automatic control unit.

In addition to this plugging, the "G. I. Plug Switch", must be turned to IND (indicate). If this switch is turned to LIST, the normal action of the group indicator is nullified, causing the addition of all cards. This switch is provided for convenience in changing from tabulating to individual card listing, in which case it makes replugging unnecessary.

Card Counting

The "card count" makes it possible to count the total number of cards tabulated, the number of cards in specific classes, as identified by distinctive X's, or the number of control groups tabulated. For this purpose the "CC" hub, located at the left of the "class selector pick-up" hubs, is plugged to any desired counter positions, just as in the case of an adding brush.

The "CC" hub supplies a "1" impulse during every card cycle. This impulse can be plugged directly to a counter to count every card, through class selectors to counters to count the number of cards in different classes, or through the group indicator to a counter to count the number of minor control groups.

Methods of Wiring for Group Indication When Listing

SECTION	DEPT.	ACCOUNT	ACCOUNT TOTALS	DEPT. TOTALS	SECTION TOTALS
24	2	201	4634		
24	2	202	1021		
24	2	203	647	6302	
24	5	201	821		
24	5	202	1052		
24	5	203	157	2030	
24	17	201	692		
24	17	206	1214		
24	17	208	4750	6656	14988
26	3	201	694		
26	3	202	1451		
26	3	203	2400	4545	
MAJOR	INTER. CONTROL	MINOR	MINOR TOTALS	INTER. TOTALS	MAJOR TOTALS
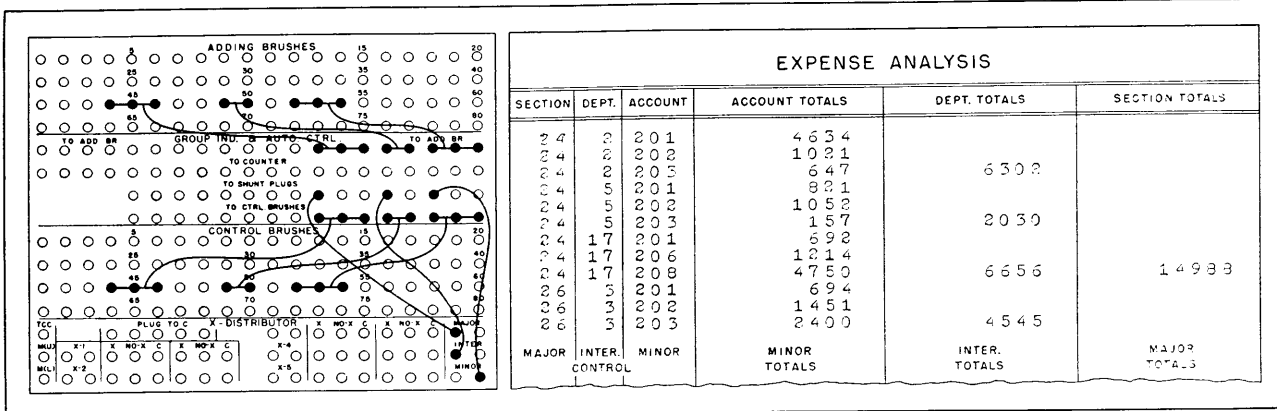
Plugging for Automatic Control

Automatic Control

Automatic control causes the machine to stop and print group totals immediately after the last card of each control group has passed the adding brushes. It also determines whether the last card is the last of a minor, intermediate, or major classification, and controls the printing of the corresponding totals. An example of plugging for all three classes of control is shown. (Intermediate control is a standard feature on Type 297 machines only, but is available as a special feature on Type 285 machines.)

In this example, it should be noted that the card columns included in the minor, intermediate, and major classifications are plugged in the order named, in consecutive control positions, beginning at the right side of the plugboard. It should be noted also that the "shunt" plugwires are inserted in the last control positions plugged for each class of control, and can be plugged to either hub of each common pair of "shunt-hubs." In addition to this plugging, the corresponding "control switches" must be ON.

Total Printing

Total printing is controlled by the "counter dials" and "symbol hubs," and in the case of balance counters, by the "balance switches" and "balance control hubs" also.

The setting of each counter dial determines *WHEN* the corresponding counter will reset and total print. When a counter dial is turned to TOTAL NON RESET, the corresponding counter prints "progressive totals." When turned to MINOR, INTER, or MAJOR, the counter resets and total prints whenever a change occurs in the corresponding class of control.

With balance counters, in addition to the setting of their counter dials, the plugging of their balance control hubs determines *WHETHER* negative counter balances will be printed. If the balance control hubs are not plugged, no balances can be printed. Examples of balance control plugging to print all balances, and to print positive balances only, are shown in the figure "Wiring of Balance Control Hubs."

When the balance control hubs are plugged to print + or — balances, as in the case of No. 5 counter, the position of the corresponding balance switch determines *HOW* negative balances will be printed. When balance switches are OFF, negative balances are printed as they appear on the counter (i.e., as complements). When balance switches are ON, negative balances are automatically converted and printed in true figures.

When the balance control hubs are plugged to print positive balances only, the corresponding balance switches must be ON or nothing will be printed.
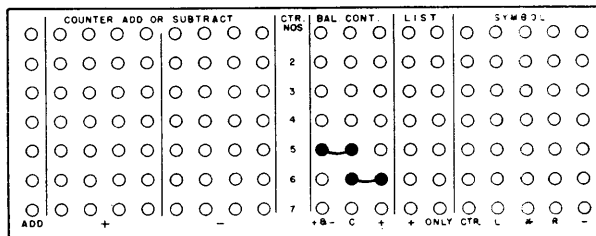
Wiring of Balance Control Hubs

The interrelation of counter dials, balance control plugging, and the balance switches is illustrated by the chart shown next, which indicates, as an example, the circuit which is completed for printing all intermediate balances in

COUNTER DIAL	BALANCE CONTROL PLUGGING	BALANCE SWITCH
THE SETTING OF THIS DIAL DETERMINES **WHEN** BALANCES WILL BE PRINTED	THIS PLUGGING DETERMINES **WHETHER** NEGATIVE BALANCES WILL BE PRINTED	THE SETTING OF THIS SWITCH DETERMINES **HOW** NEGATIVE BALANCES WILL BE PRINTED

BALANCE PLUGGING	BALANCE SWITCH	ACTUAL BALANCE IN COUNTER	PRINTED TOTAL
+a— c + (●—● ○)	OFF	999998508	*999998508
(●—● ○)	ON	999998508	* 1492CR
(○ ●—●)	OFF	999998508	
(○ ●—●)	ON	999998508	
(○ ●—●)	OFF	1492	
(○ ●—●)	ON	1492	1492

The Relationship of Counter Reset Dials, Wiring, and Balance Switches

true figures. The dotted lines indicate all possible routes while the heavy flow line shows the route followed in the particular example stated.

For convenient reference, the principles involved in balance counter total printing control are summarized in the table shown above.

The "symbol" hubs, located in the lower right corner of the plugboard, are provided for control of the left-hand type bars in Type 285 adding counter banks, and of both left- and right-hand type bars in all balance counter banks.

All adding counter banks automatically print asterisks from their right-hand type bars beside all totals, but on Type 285 machines "CTR" and "L" hubs are provided so that the left-hand type bars may or may not be used for total printing. For maximum total printing capacity these two hubs should be plugged together. They must not be plugged together, however, when complements are being added, or the complement carry-over and intervening zeros will be printed, as shown in the chart below.

TYPE OF BANK	SYMBOL PLUGGING	PRINTED TOTALS	REMARKS
TYPE 285 ADDING COUNTERS	CTR L * R (○ ○)	1234*	AUTOMATIC ASTERISK WITHOUT PLUGGING
	(●—●)	123456789*	FOR MAXIMUM TOTAL PRINTING CAPACITY
	(●—●)	300001234*	WRONG, IF ADDING COMPLEMENTS
ALL BALANCE COUNTERS	(○ ○ ○ ○)	1234CR	AUTOMATIC "CR" WHEN LISTING SUBTRACTED ITEMS
	(○ ○ ●—●)	1234*	ASTERISKS WITH BALANCE SWITCH OFF
	(●—● ●—●)	123456789*	FOR MAXIMUM CAPACITY AS WELL AS ASTERISK WITH BALANCE SWITCH OFF
	(○ ●—● ○)	(*)* 1234CR	CREDIT TOTAL WITH BALANCE SWITCH ON
	(○ ●—● ○)	(*)* 1234	DEBIT TOTAL WITH BALANCE SWITCH ON

NOTE * - LEFT * IS IN 11TH BAR IN TYPE 297 MACHINES

Symbol Printing

In addition to "CTR" and "L" hubs, balance counter banks are also provided with "*", "R", and "—" hubs. The "R" hubs, representing the right-hand type bars, should be plugged to "*" hubs when all totals are to be debits, and the Balance Switch turned OFF. When credit totals are to be printed in true figures, "CR" symbols will be printed automatically beside each credit total if the Balance Switch is ON. In this case the "L" hub of the same bank may be plugged to an "*" hub to print an asterisk at the left of every total. The results obtained by different uses of these "symbol" hubs are illustrated by the chart, "Symbol Printing."

Operating Switches and Dials

Tabulate-List Lever—When turned to TABULATE, this causes the printing unit to operate only during first-card and total cycles. When turned to LIST, it causes the printing unit to operate during all card feeding and total cycles.

Emergency Start Button—When pressed, it causes the machine to complete any card feeding cycle during which it may accidentally have stopped, as in case of power interruption.

Automatic Control Switches—These switches are turned ON as required, for major, intermediate, and minor automatic control.

G. I. Plug Switch—When turned to IND., this switch causes the group indicator to operate normally, permitting addition of first cards only. When turned to LIST, it nullifies the action of the group indicator, causing the addition of all cards.

Total Print Switch—This switch is normally left ON, and is turned OFF only to suppress all total printing.
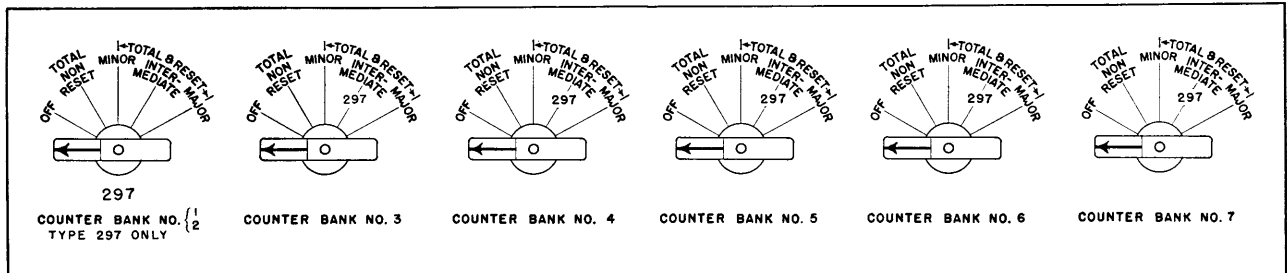
List Switches—List Banks—When turned to IND., only first cards are listed. When turned to LIST, all cards are listed.

List Switches—Counter Banks — When turned ON, amounts added or subtracted in counters are listed, subject in case of balance counters to the plugging of the list control.
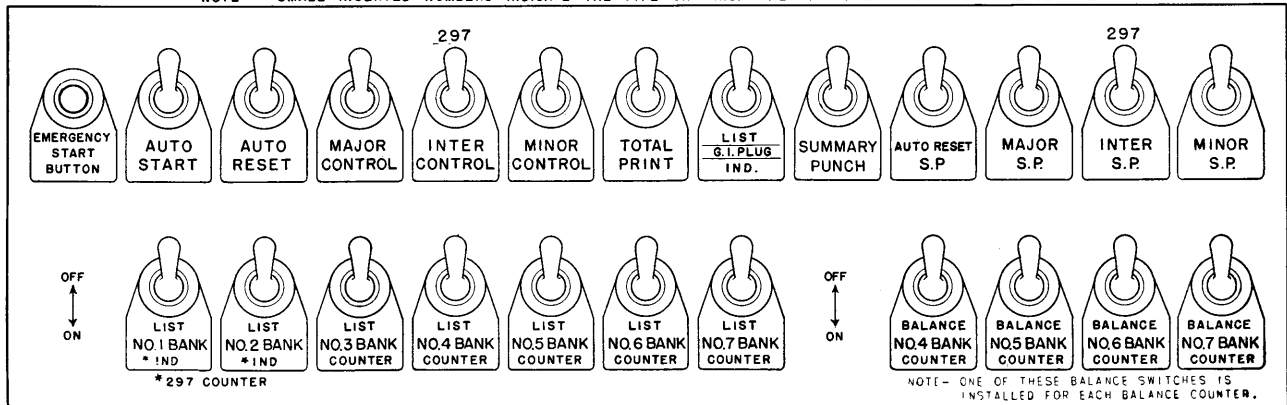
Balance Switches—When OFF, balances as accumulated in balance counters are total printed. When ON, negative counter balances for total printing are converted into true figures. To print an asterisk in the right hand type bar from a balance counter, the Balance Switch must be OFF. "CR" symbols for credit totals are printed automatically without plugging, if the Balance Switch is ON.

Summary Punch Switch—When ON, a machine is connected with its summary punch. This switch should be OFF when the summary punch is idle or is being used as a key punch.

TYPE 285 — SWITCHES AND DIALS —— TYPE 297

COUNTER BANK NO. {1 2} TYPE 297 ONLY | COUNTER BANK NO. 3 | COUNTER BANK NO. 4 | COUNTER BANK NO. 5 | COUNTER BANK NO. 6 | COUNTER BANK NO. 7

NOTE —— SMALL INSERTED NUMBERS INDICATE THE TYPE ON WHICH THE PARTICULAR FEATURE IS EXCLUSIVE

EMERGENCY START BUTTON | AUTO START | AUTO RESET | MAJOR CONTROL | INTER CONTROL | MINOR CONTROL | TOTAL PRINT | LIST G.I. PLUG IND. | SUMMARY PUNCH | AUTO RESET S.P | MAJOR S.P | INTER S.P | MINOR S.P

LIST NO.1 BANK *IND | LIST NO.2 BANK *IND | LIST NO.3 BANK COUNTER | LIST NO.4 BANK COUNTER | LIST NO.5 BANK COUNTER | LIST NO.6 BANK COUNTER | LIST NO.7 BANK COUNTER | BALANCE NO.4 BANK COUNTER | BALANCE NO.5 BANK COUNTER | BALANCE NO.6 BANK COUNTER | BALANCE NO.7 BANK COUNTER

*297 COUNTER

NOTE— ONE OF THESE BALANCE SWITCHES IS INSTALLED FOR EACH BALANCE COUNTER.

Auto Reset S. P. Switch—When ON, normal operation of the summary punch is permitted, eject and feed cycles occurring immediately after each card has been punched. When turned OFF, immediate ejection of the card is prevented to permit substitution of a new summary master card, after which normal operation is resumed by pressing the reset button.

Major, Inter, and Minor Control Switches— When ON, the punching of a summary card for each total of their respective control classes is caused. Only one class of summary cards can be punched in a single run. If more than one of these switches is ON, cards are punched only for the subordinate control class involved.

Counter Dials—When turned OFF, their respective counters neither total print nor reset. When turned to TOTAL NON RESET, progressive totals are printed. When turned to MINOR, INTERMEDIATE, or MAJOR, totals are printed and the counters reset at each change in the corresponding class of control.

Standard Features of Type 285 and Type 297
Electric Bookkeeping and Accounting Machines

FEATURES		TYPE 285	TYPE 297
Card Columns		80	80
Print Unit Capacity (potential)		7 Banks	7 Banks
Print Banks Installed		3, 4, 5, 6 or 7	7 Only
List Banks	Number	1, 2, 3, 4 or 5	None or 1
	Positions	10 in Nos. 1, 2, and 3 Banks 9 in Nos. 4, 5, 6, and 7 Banks	10
Counter Banks	Number	2, 3, 4 or 5	6 or 7
	Positions	10 in No. 3 Bank 9 in No. 4, 5, 6, and 7 Banks	10
Balance Counters (*)	Number	None, 1, 2, 3, 4 or 5	4, 5, 6, or 7
	Positions	9	10
Adding Counters	Number	2, 3, 4 or 5	2 or 3
	Positions	8 adding 1 accumulating	10
Automatic Control	Classes	Major and Minor	Maj. Inter. & Min.
		6 or 16	16
Group Indication	Positions	10 or 20	20
Class Selectors		1 with 1 or more balance counters	1
Speed		75/75, 75/150, 120/120, 120/150	100/150
Current Supply		110 or 220 D.C.	110 or 220 D.C.
Reset Time		1.1 seconds	1.1 seconds
(*) Balance Counters can be installed in the field.			

Special Devices for Accounting Machines (Subtraction)

Fractions

Type 285 and Type 297 Accounting Machines can be equipped for the handling of fractions when specified. The fractions which are available and the conditions under which they may be used are set forth below. For purposes of discussion, the available fractions can be grouped as follows:

Group   I—1/2, 1/3, 1/4, 1/5, 1/6, 1/8
Group   II—1/12
Group III—1/16, 1/20, 1/60

Punching

Group I—All these fractions can be punched directly in one column for use with all types of machines; for example, 1/6 is punched 1, 2/6 is punched 2, 3/6 is punched 3, etc.

Group II—Twelfths may be punched in one column. The twelfths from zero to nine are punched 0 to 9, ten twelfths (10/12) is punched "X", and eleven twelfths (11/12) is punched "R."

Twelfths for other types of accounting machines, such as the Type 601 Cross-footing Multiplying Punch, can be supplied only as combinations of halves and sixths. In this event, two card columns are required for the punching. On the halves and sixths basis, one twelfth is punched 01, two twelfths, 02; . . . six twelfths, 10; . . . eleven twelfths, 15. Twelfths for this group of machines will not be furnished as a combination of quarters and thirds on new orders.

Group III—These fractions are handled in the same manner for all machines. Sixteenths are punched as a combination of halves and eighths and require two card columns. 1/16 is punched 01; 2/16, 02; . . . 7/16, 07; 8/16, 10; 9/16, 11; . . . 15/16, 17. Twentieths are punched directly, without coding, in two card columns and require a combination of halves and tenths. Sixtieths are handled as a combination of sixths and tenths and also can be punched directly without coding.

Adding and Subtracting

All fractions can be added or subtracted (on subtraction machines) and require the same number of counter positions in each case as the number of card columns required for the punching of the fraction. Counter positions which are equipped with special wheels for the addition or subtraction of fractions cannot be used for ordinary decimal work.

When twelfths are used, it is necessary to wire from the control brushes as well as from the adding brushes. A special hub is provided for this purpose.

Listing and Total Printing

Fractions in Group I require only one type bar for listing or total printing. All other fractions require two type bars. On numerical machines these type bars cannot be utilized for any other work due to their fixed connection to counter positions.

Balance Printing

Both positive and negative balances can be printed in positive figures from balance counters for all fractions. The counter position requirements noted above are sufficient for balance printing in numerical machines.

Digit Selector

The digit selector is a special device for Electric Accounting Machines by means of which such units as class selectors, X-distributors, etc., which are normally X-controlled, may also be controlled by any desired punched digit (or digits) of a card column. With this device, therefore, one column of a card can be used for punching the equivalent of 12 controlling X's.

The device is represented on the plugboard by one "D. S. C." (digit selector common) hub and twelve common pairs of "digit" hubs as shown in Figure No. 1. Internally, the device consists of an emitter which operates during every card-feeding cycle, and connects each pair of "digit" hubs to the "common" hub in turn, as the corresponding card positions pass under the brushes. The operating diagram in Figure No. 1 illustrates the manner in which these successive connections are made.

Each class selector and X-distributor position is provided with a pair of special pick-up hubs, designated "D" (digit pick-up), which permit control of the units by any digit. These special hubs are in addition to the regular X pick-up hubs which permit X-control only, in the normal manner. A "D. I." (digit impulse) hub is provided also for use with the digit selector for the accumulation or listing of constant data.

A typical example of the use of a digit selector for controlling a class selector and X-distributor is illustrated in Figure No. 2. In this

DIGIT SELECTOR
PLUGBOARD ARRANGEMENT —— OPERATING DIAGRAM
FIG. NO. 1

FIGURE NO. 2
DIGIT CONTROL OF CLASS SEL. AND X-DISTR.
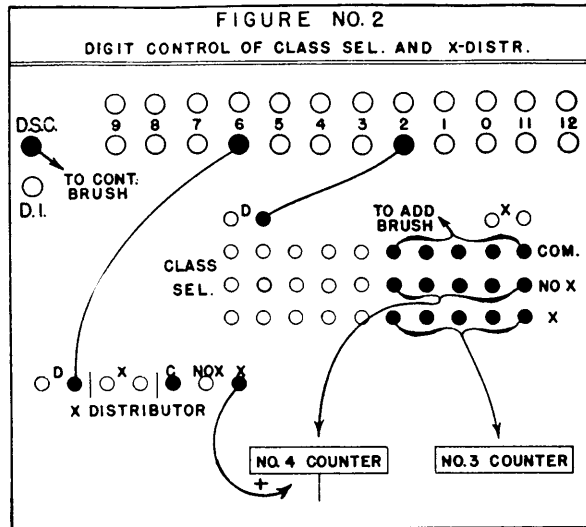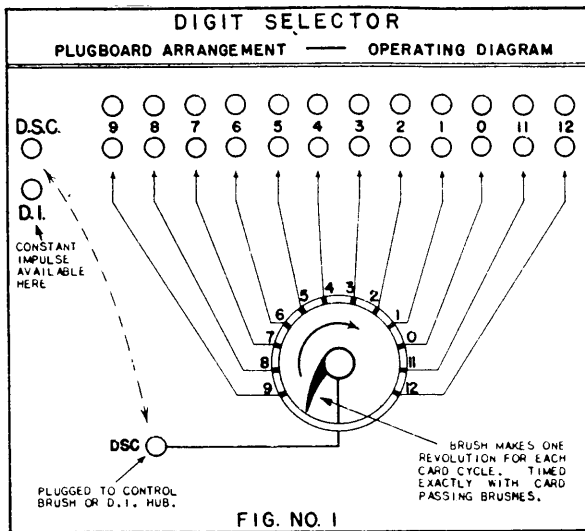
example, cards punched "2" in the controlling card column cause the class selector to be "controlled," thereby directing the adding-brush impulses to Counter No. 3. All other cards are directed to Counter No. 4. Counter No. 4, however, adds only those cards which are punched "6" in the control column, as directed by the X-distributor under control of the digit "6".

It should be noted that although the digit pick-up impulses are supplied at points other than X in the card cycle (2 and 6 in this example), the units being controlled are not affected until after the X point in the cycle, or, in other words, they operate as though they were X-controlled.

Progressive X Distributor

The Progressive X Distributor is available and may be specified on all subtraction machines in place of the standard Individual X Distributor. It is employed particularly when it is necessary to have one X control punching cancel another or where it is desirable to punch only one control X in each type of card.

The Progressive X Distributor consists of five class selector units, as illustrated, internally wired in series, the NoX position of each selector being connected to the common position of the next selector in the series. The control impulse hubs are wired permanently to the common position of selector No. 5.

The distributor permits the handling of six separate classes of cards in different ways, these cards being designated by NoX, X1, X2, X3, X4, and X5. Because of the fixed wiring of the relays in series, an order of preference is established for cards punched with more than one X, or cards of certain types punched with a different control X for each type. For example, a card X-punched in the column which is wired to X4 of the distributor and also in that wired to X5 will be treated as though it were punched for X5 only.

PROGRESSIVE X DISTRIBUTOR

O O O O O NO X O O
O O O O O X 1 O O
O O O O O X 2 O O
O O O O O X 3 O O
O O O O O X 4 O O
O O O O O X 5 O O