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40 Sheets-Sheet 1

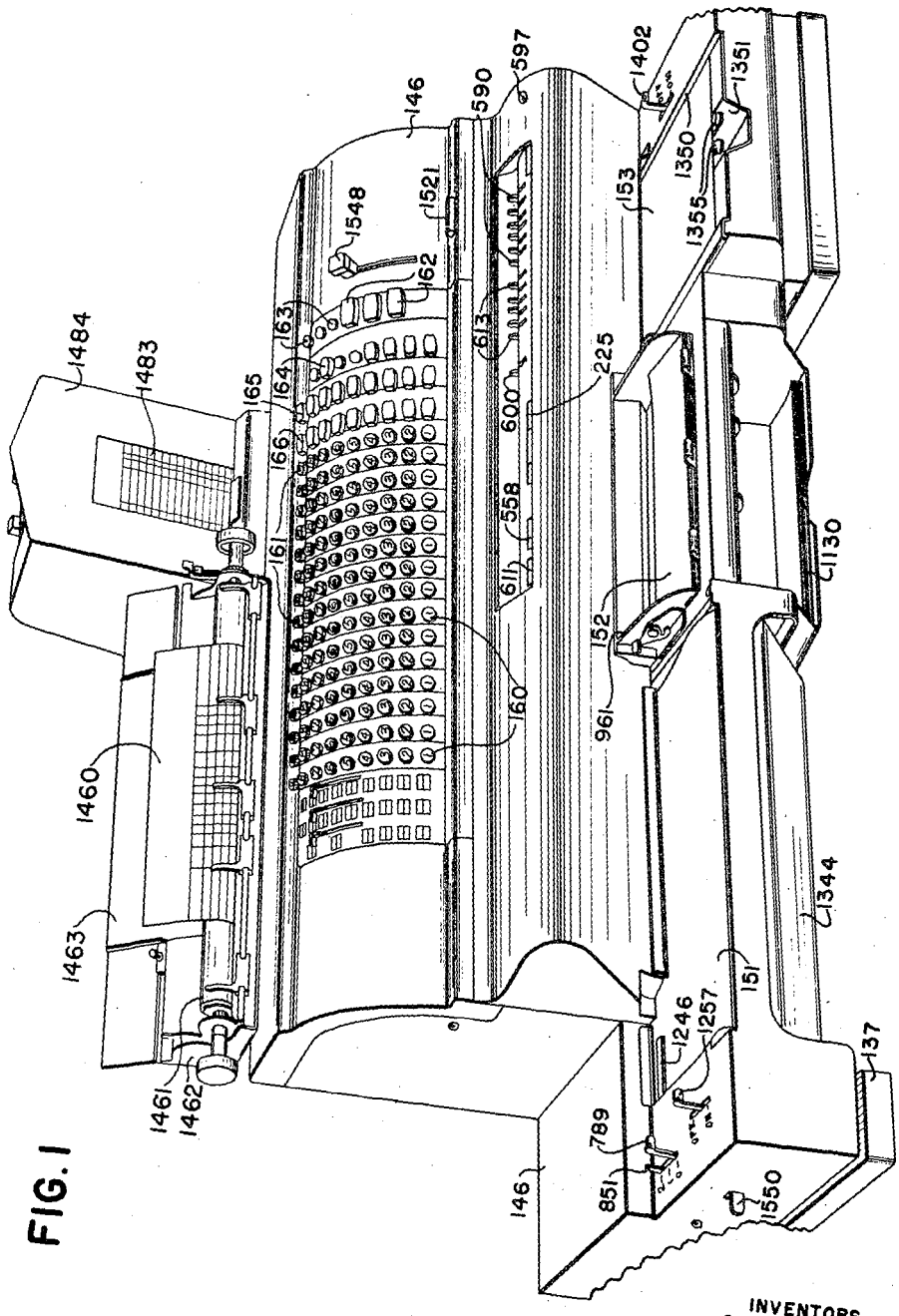

FIG. 1

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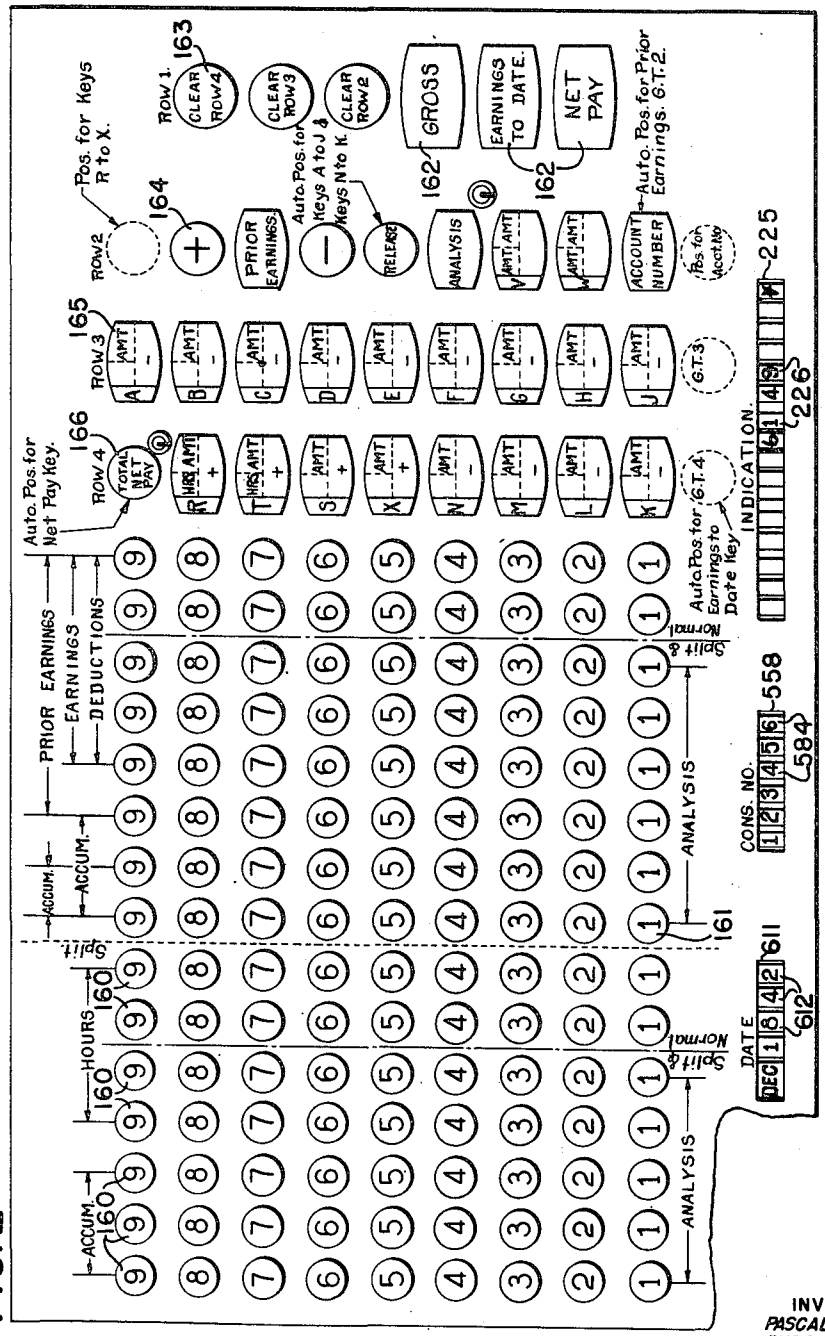

FIG. 2

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FIG. 3

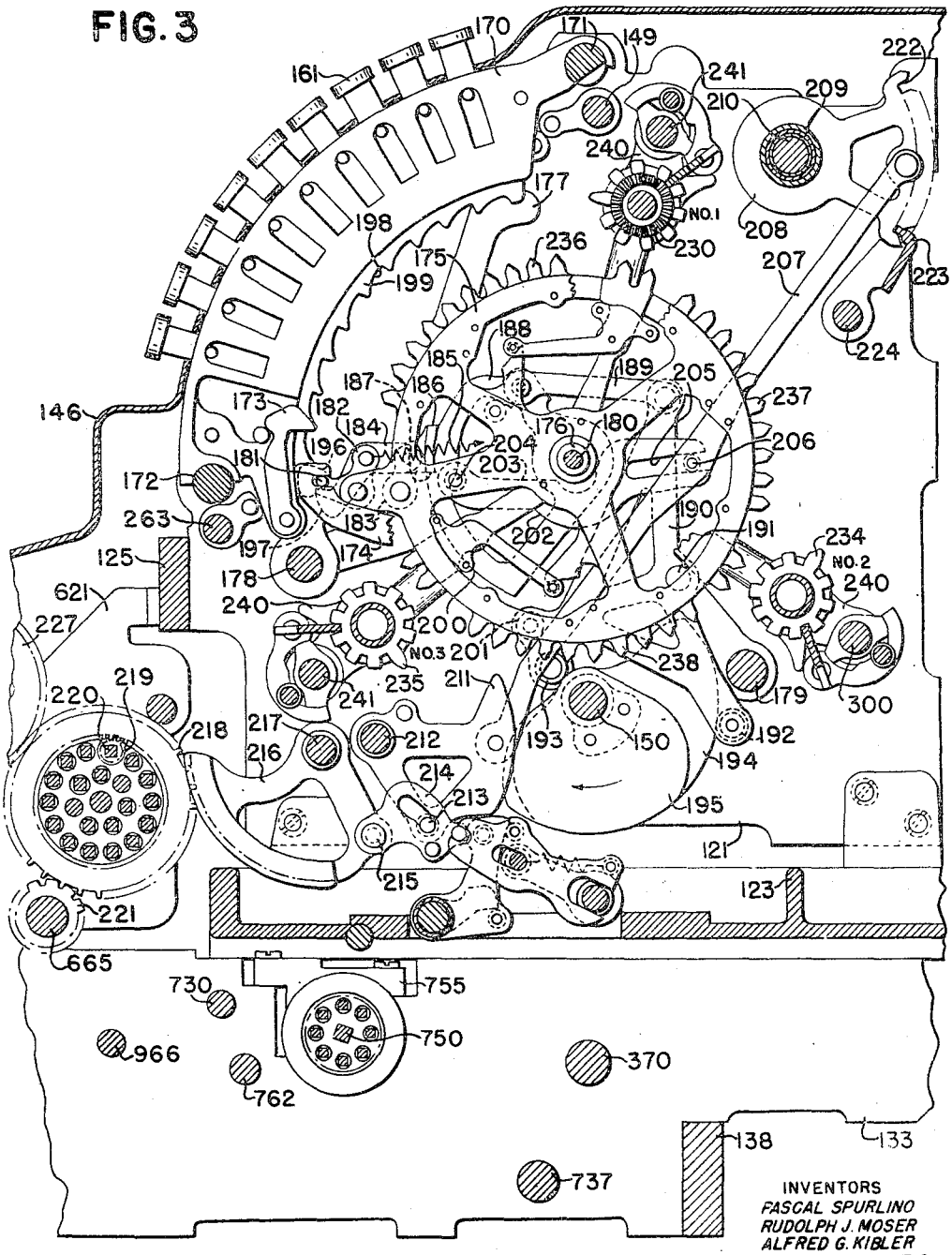

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FIG. 4

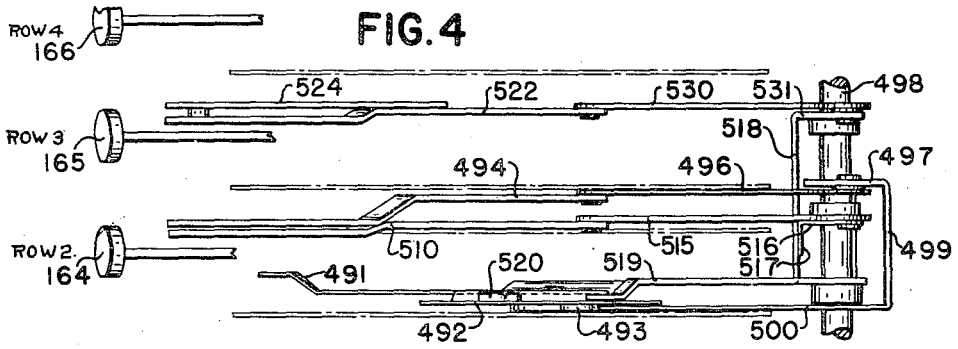

FIG. 5

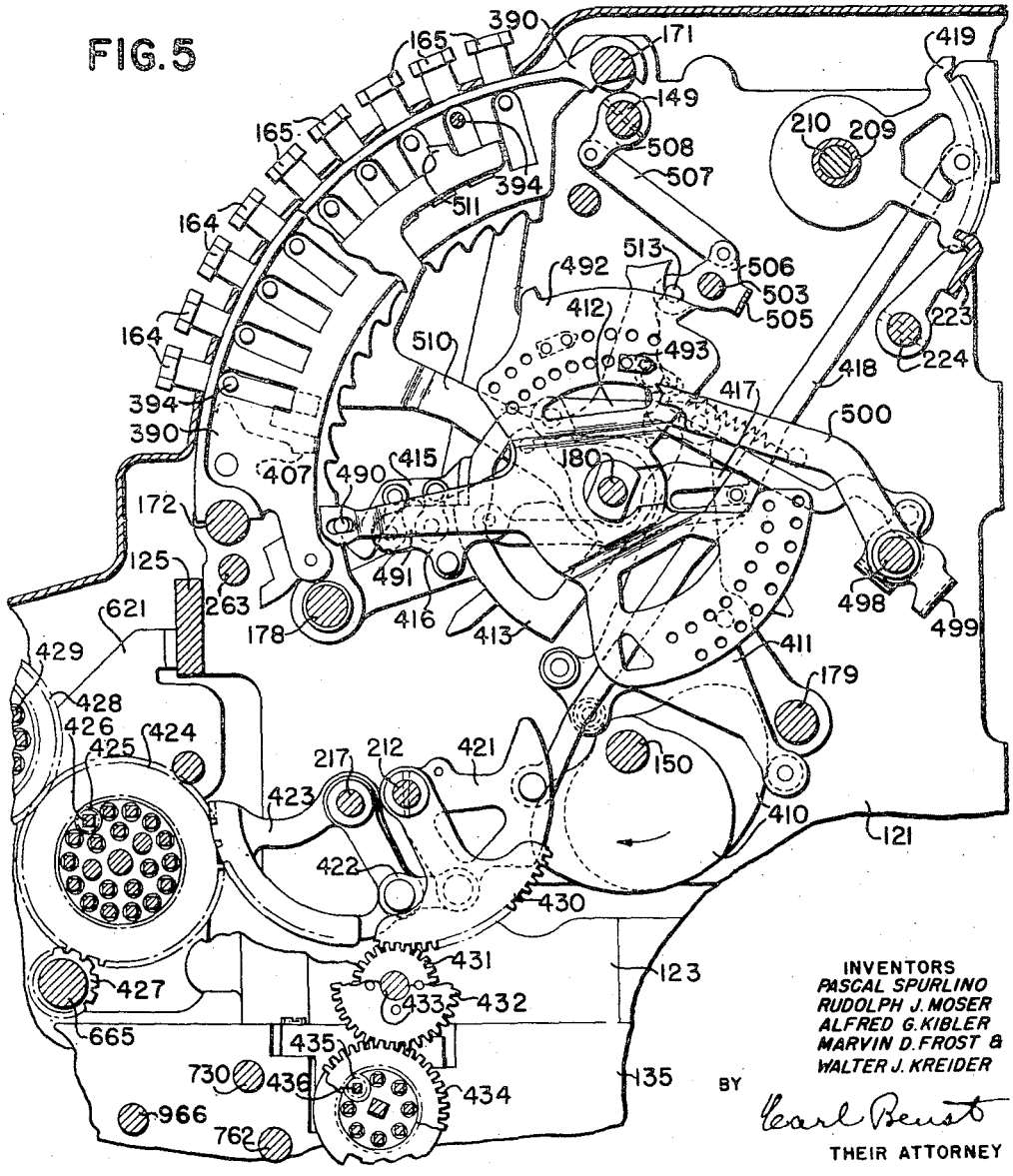

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FIG. 6

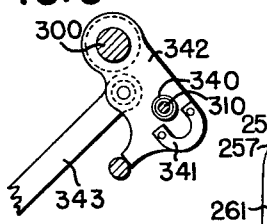

FIG. 7

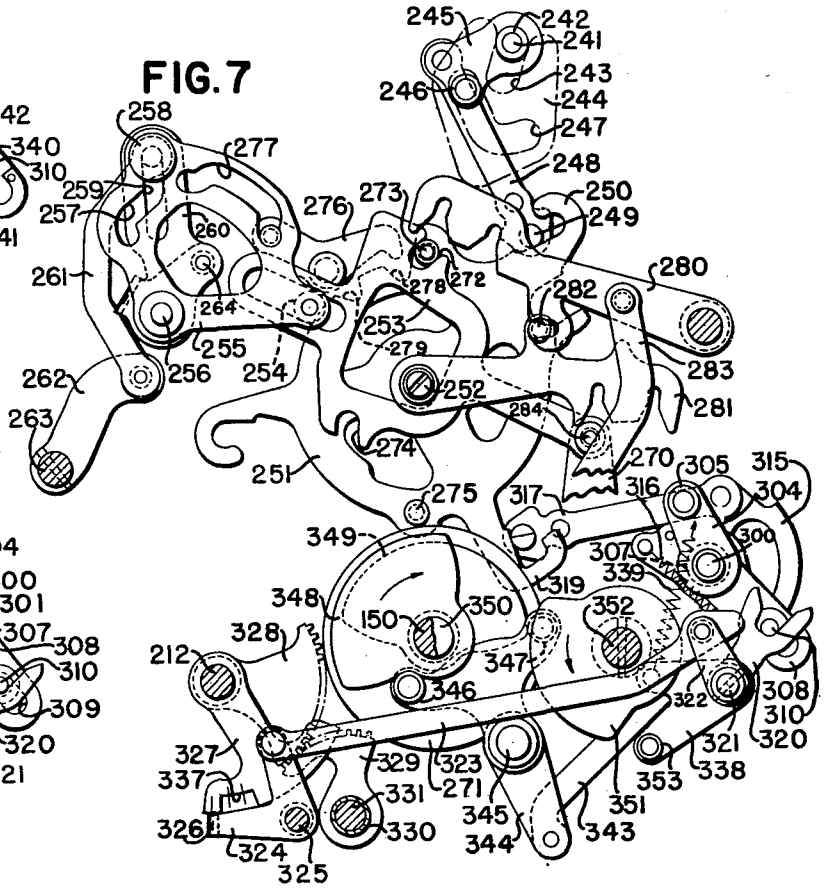

FIG. 8

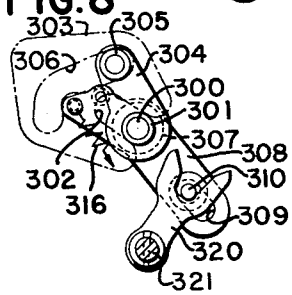

FIG. 9

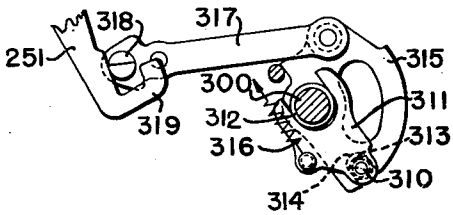

FIG. 10

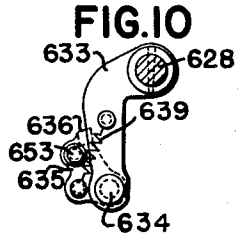

FIG. 11

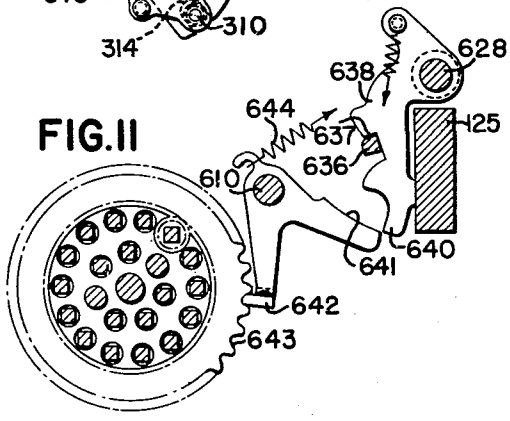

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FIG.12

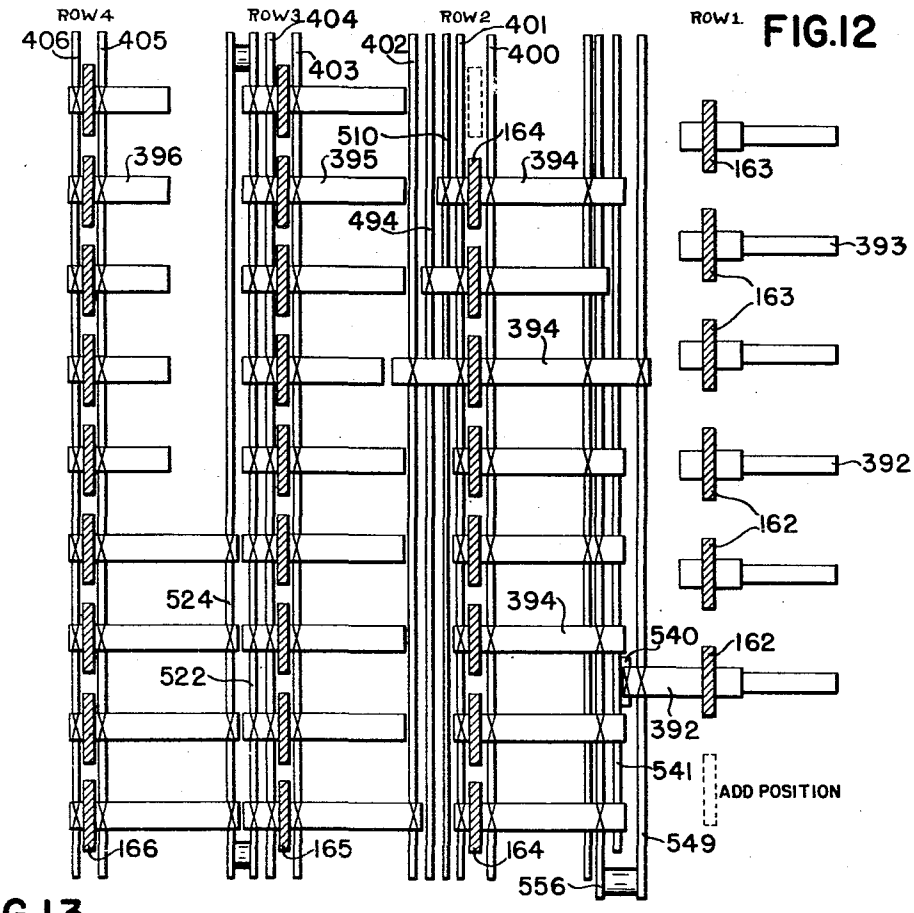

FIG.13

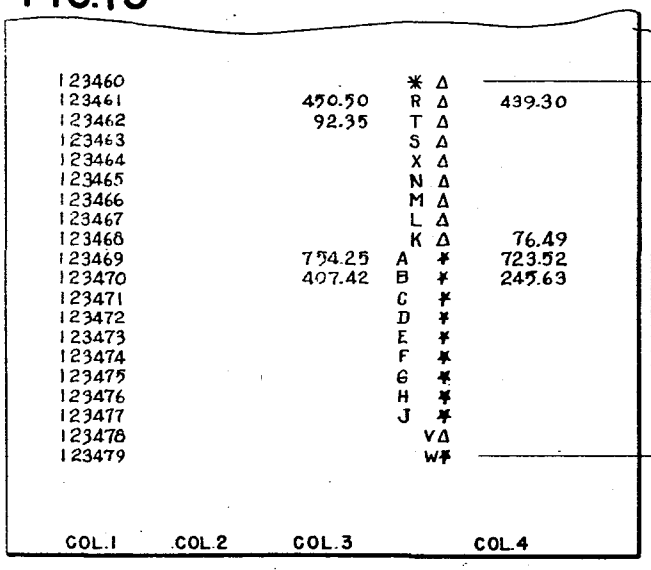

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FIG.14

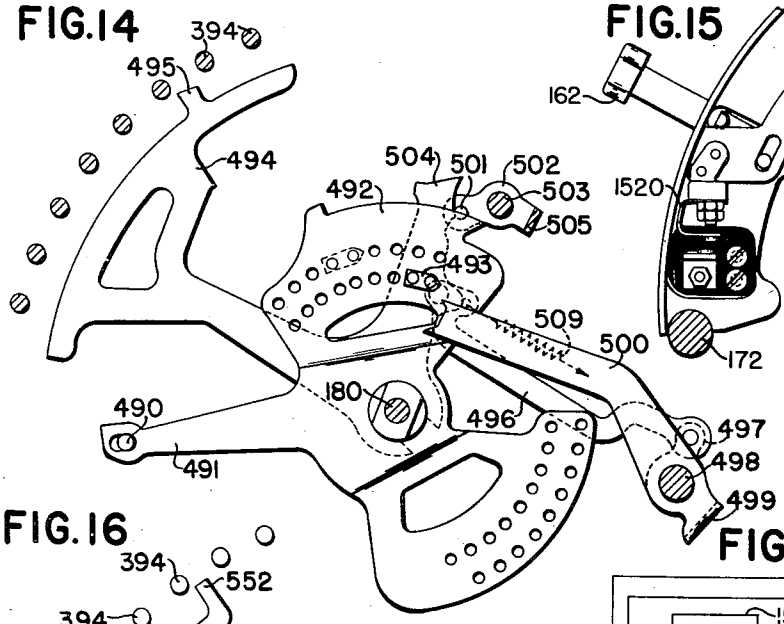

FIG.15

FIG.16

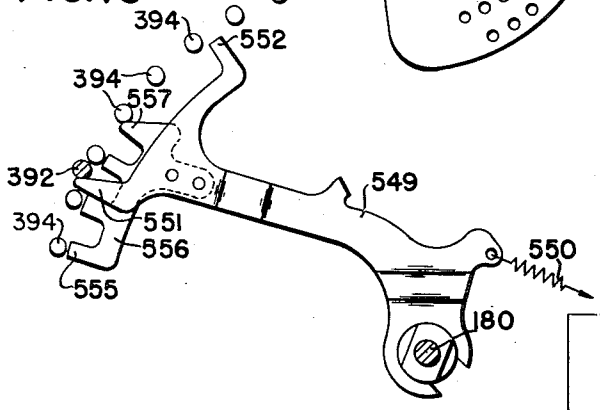

FIG.17

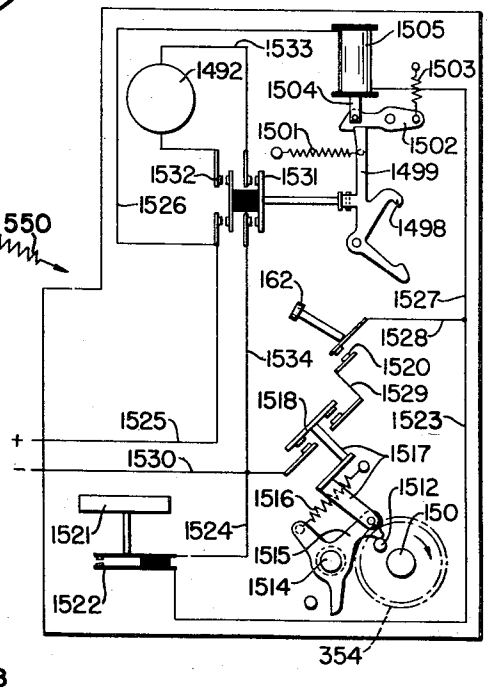

FIG.18

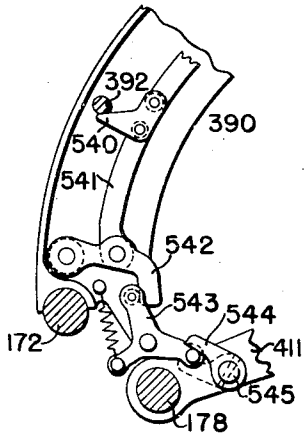

FIG.19

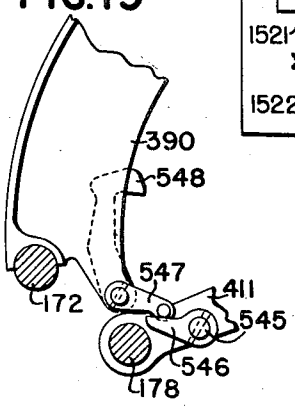

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FIG. 20

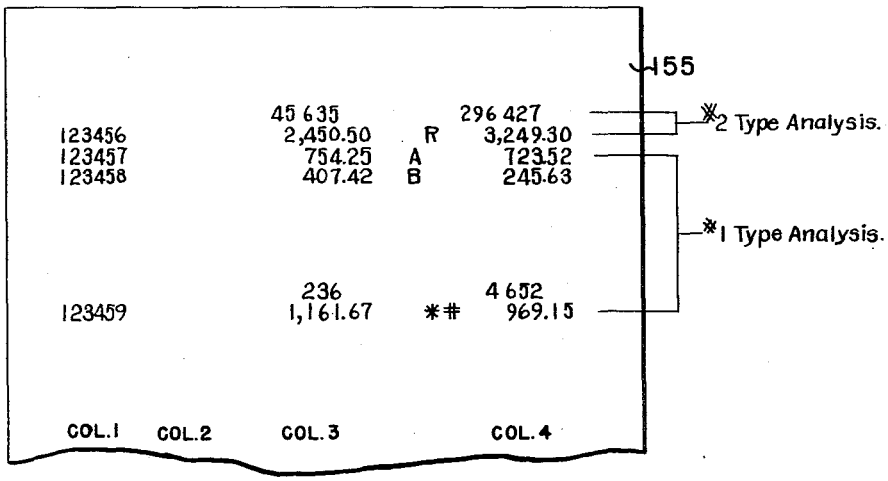

FIG. 21

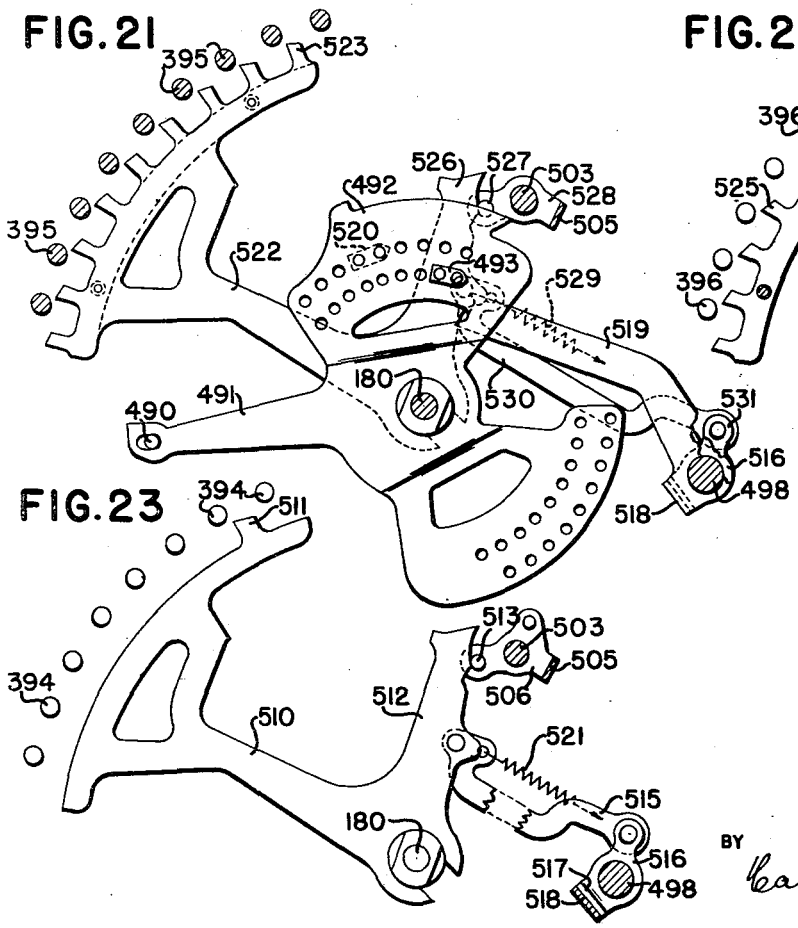

FIG. 22

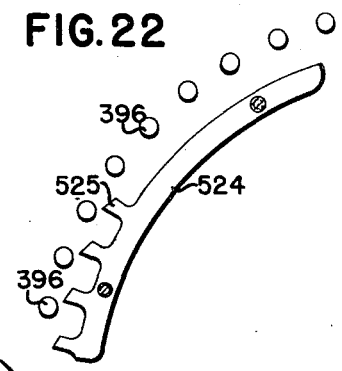

FIG. 23

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FIG. 24

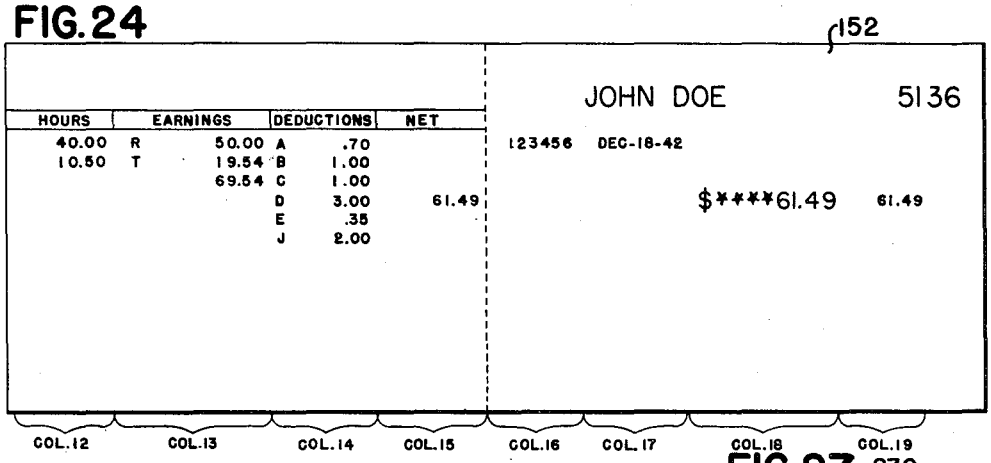

FIG. 25

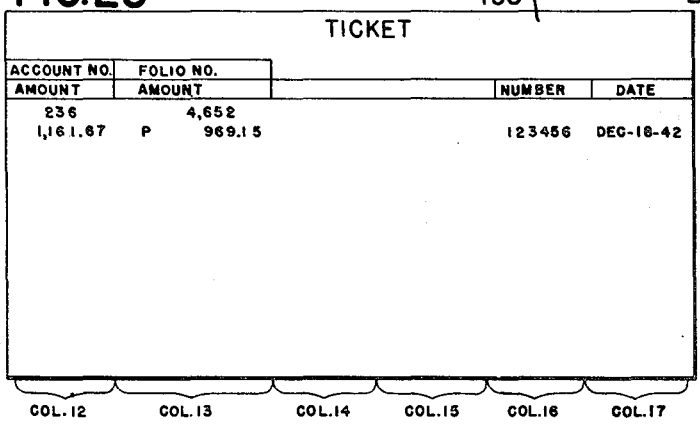

FIG. 27

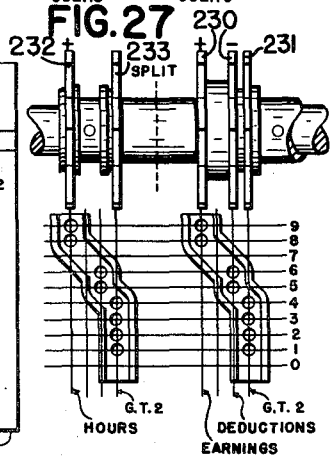

FIG. 26

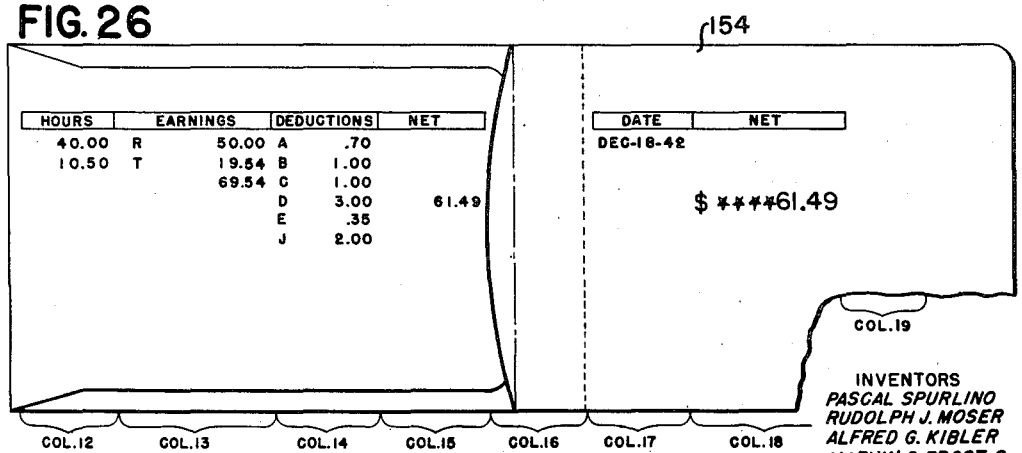

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FIG. 28

PAYROLL SUMMARY

EMPLOYEE'S NAME.		RATE	REMARKS.	NUMBER	GROSS PAY. / NET PAY.	KEY R. / KEY T.	KEY R. / KEY T.	KEY S. / KEY X.	KEY N. / KEY M.	KEY L. / KEY K.	KEY A. / KEY B.	KEY C. / KEY D.	KEY E. / KEY F.	KEY G. / KEYS H-J.
JOHN DOE	5136			1234.56	69.54 61.49	R 40.00 T 10.50	R 50.00 T 19.54				A .70 B 1.00	C 1.00 D 3.00	E .35 F 2.00	
RICHARD ROE	4021			1234.58	50.00 42.50	R 40.00 T 5.00	R 42.50 T 7.50			L 5.00 K 1.00			F 1.50	
TOTALS				COL. 1	COL. 2	COL. 3	COL. 4	COL. 5	COL. 6	COL. 7	COL. 8	COL. 9	COL. 10	COL. 11

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FIG. 29

EARNINGS RECORD

JOHN DOE. 5136

LINE NO	KEY R / KEY T	KEY R / KEY T	KEY S. / KEY X.	KEY N. / KEY M.	KEY L. / KEY K.	KEY A. / KEY B.	KEY C. / KEY D.	KEY E. / KEY F.	KEY G. / KEYS. H-J.	GROSS PAY. / EARNINGS TO DATE.
BF										2750.56
1	R 40.00 T 10.50	R 50.00 T 19.54				A .70 B 1.00	C 1.00 D 3.00	E .35 F 2.00		69.54 2820.10
2										
24										
25										
	COL. 20	COL. 21	COL. 22	COL. 23	COL. 24	COL. 25	COL. 26	COL. 27	COL. 28	COL. 29

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FIG. 30

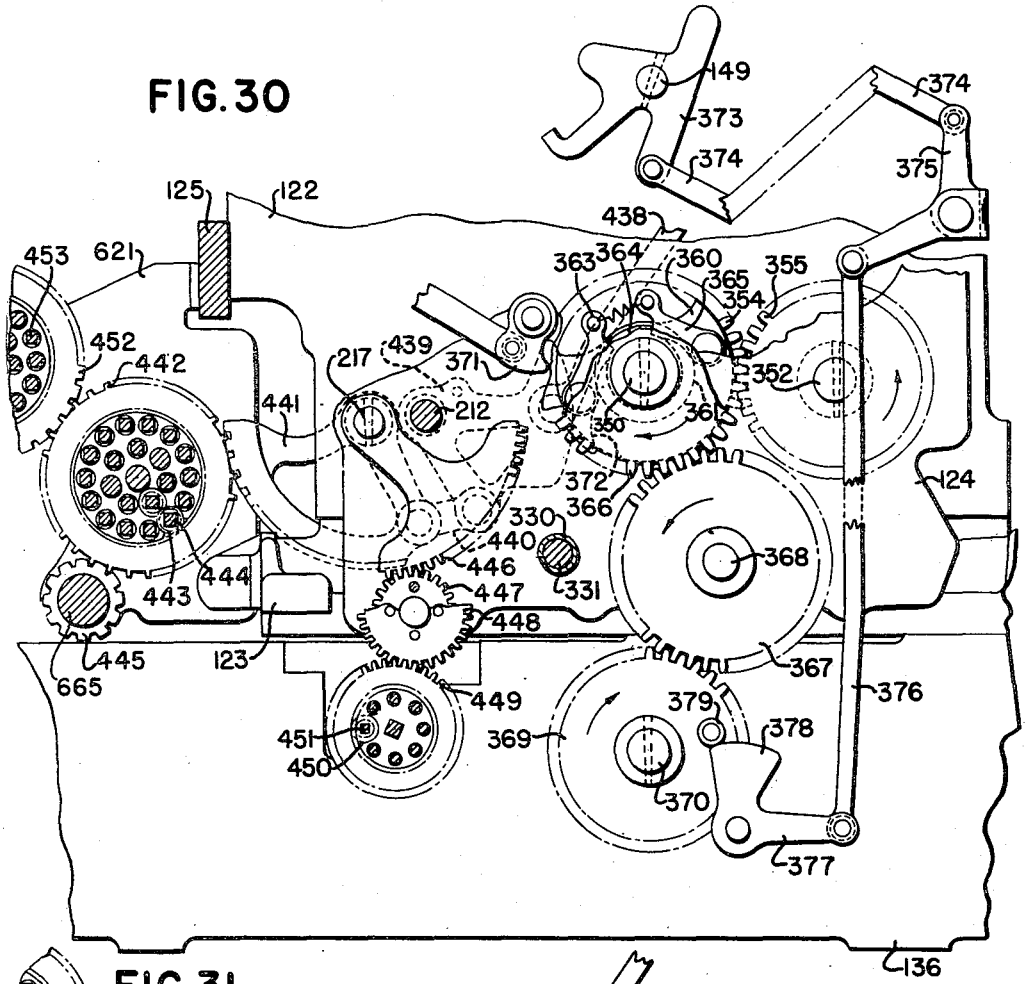

FIG. 31

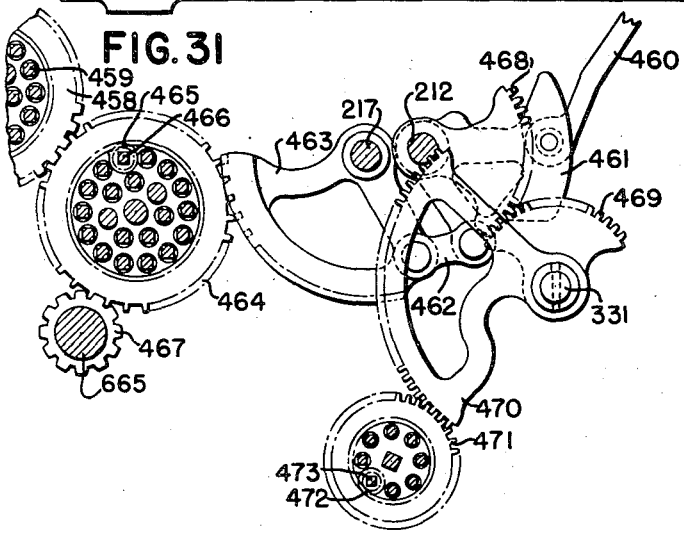

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FIG. 32

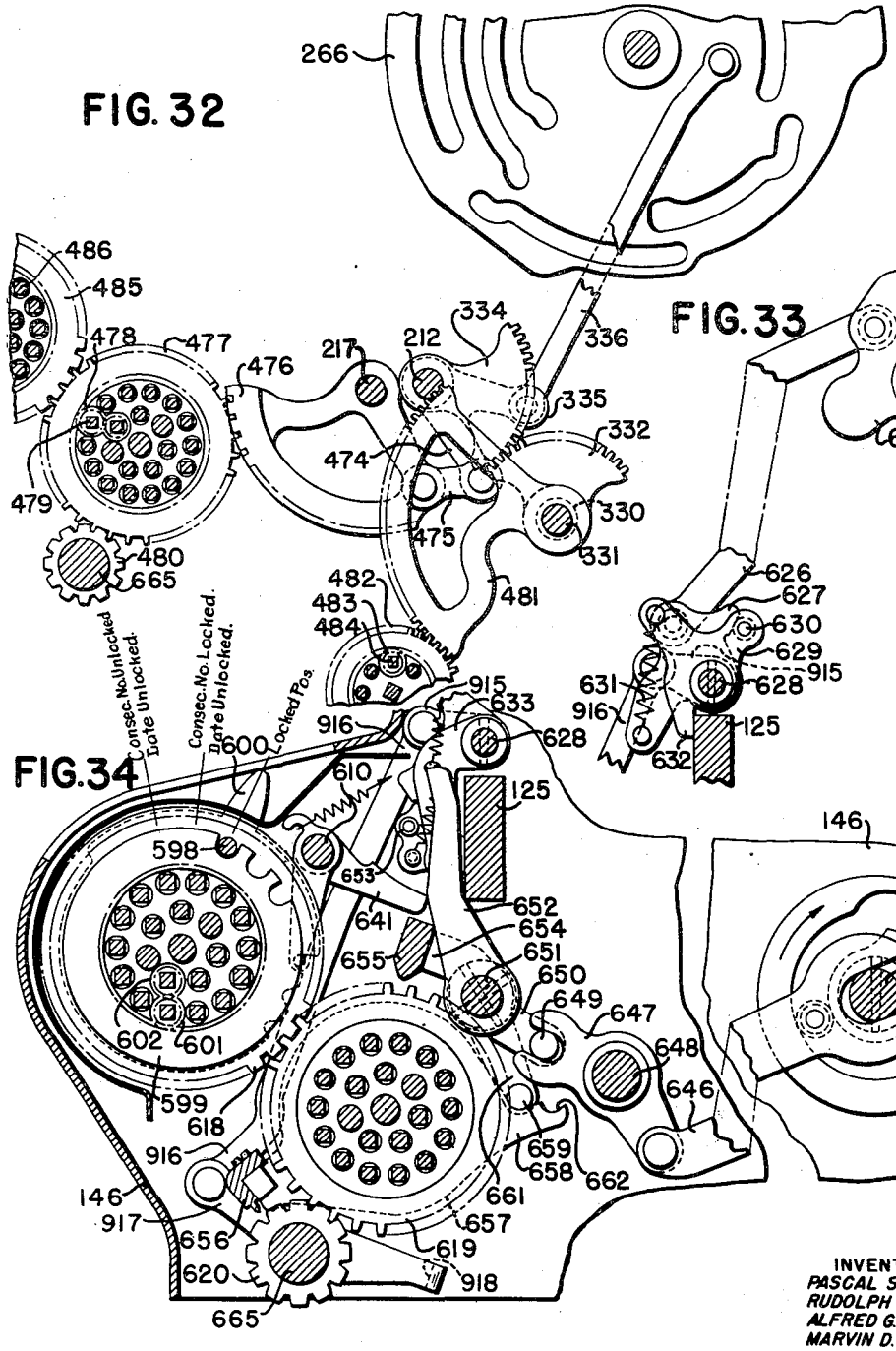

FIG. 33

FIG. 34

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FIG. 35

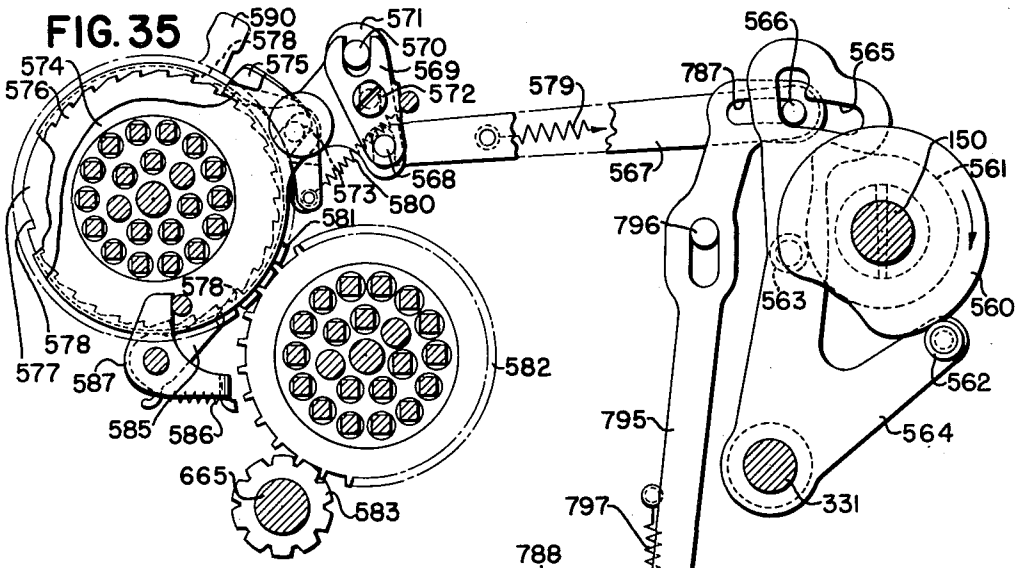

FIG. 36

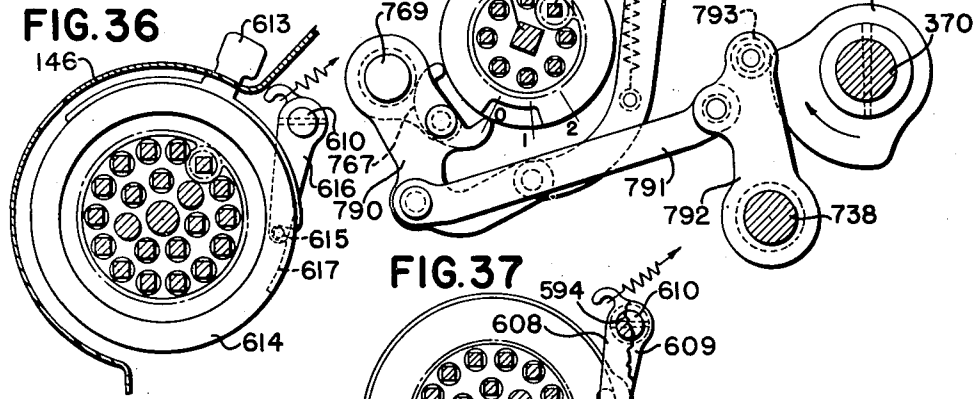

FIG. 37

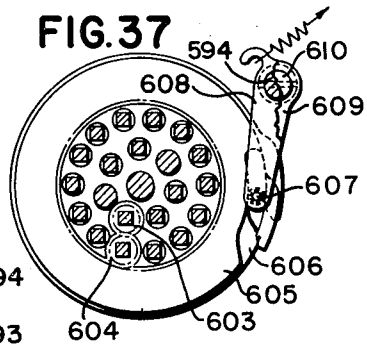

FIG. 38

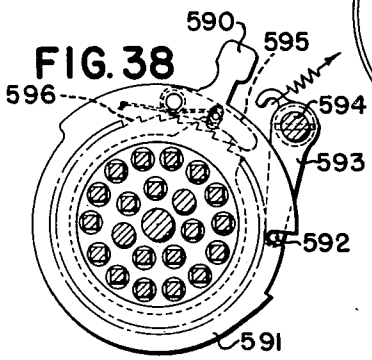

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FIG. 39

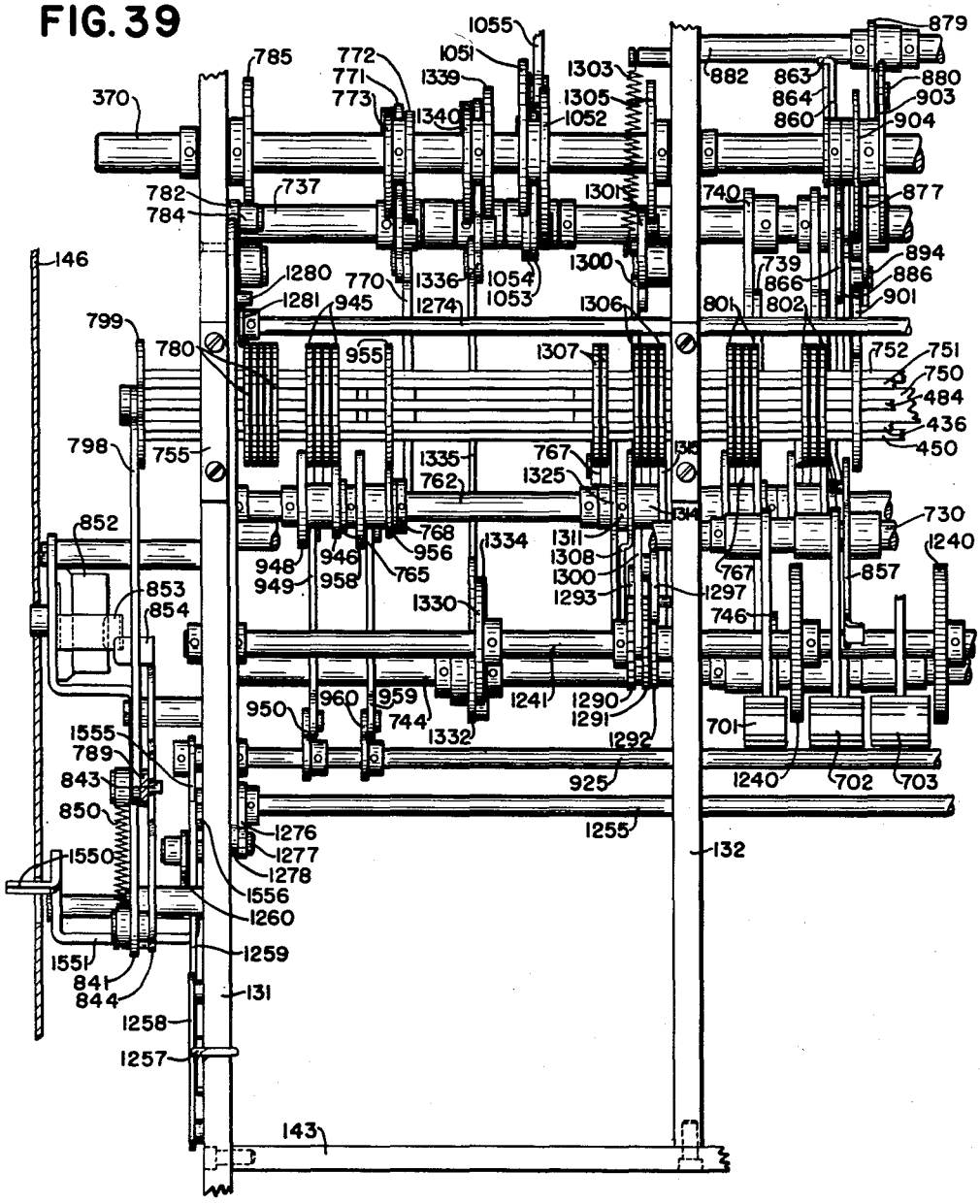
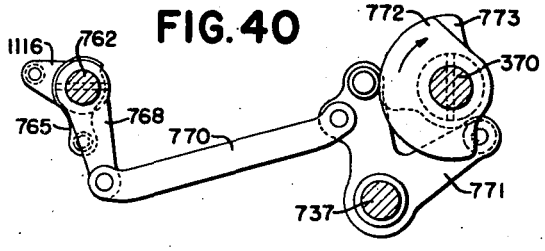


FIG. 40



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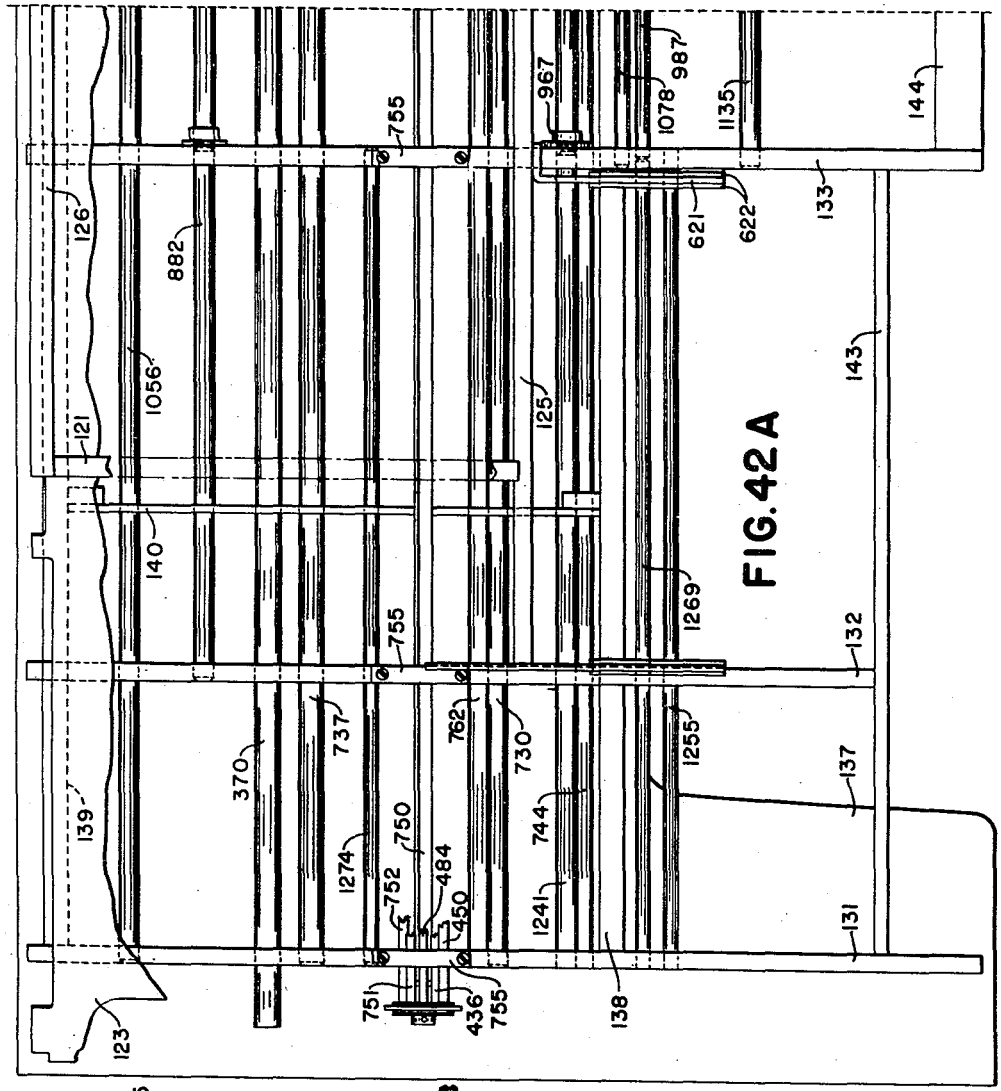

FIG. 42A

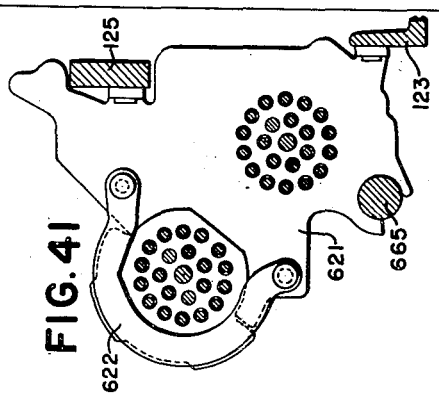

FIG. 41

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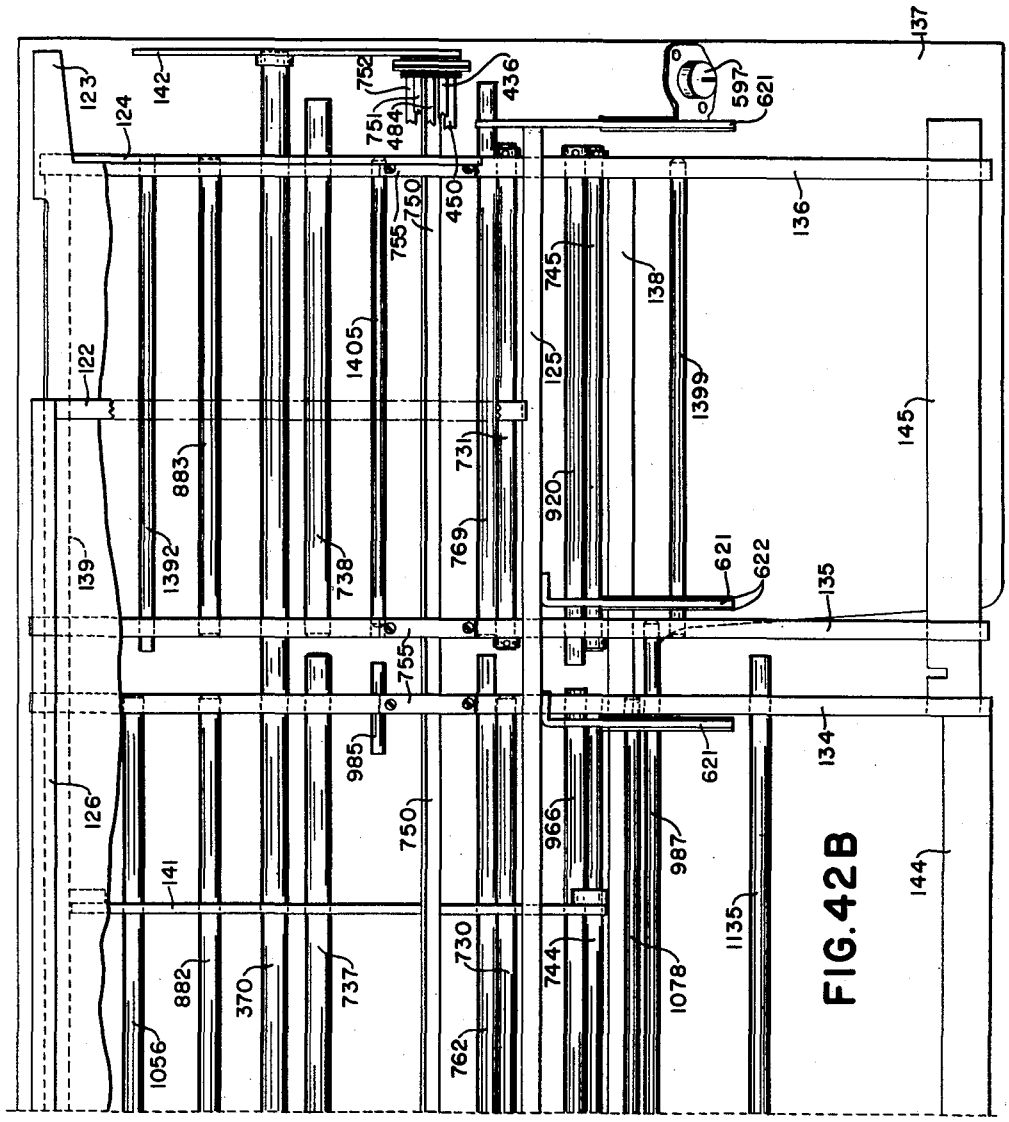

FIG. 42B

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FIG. 43A

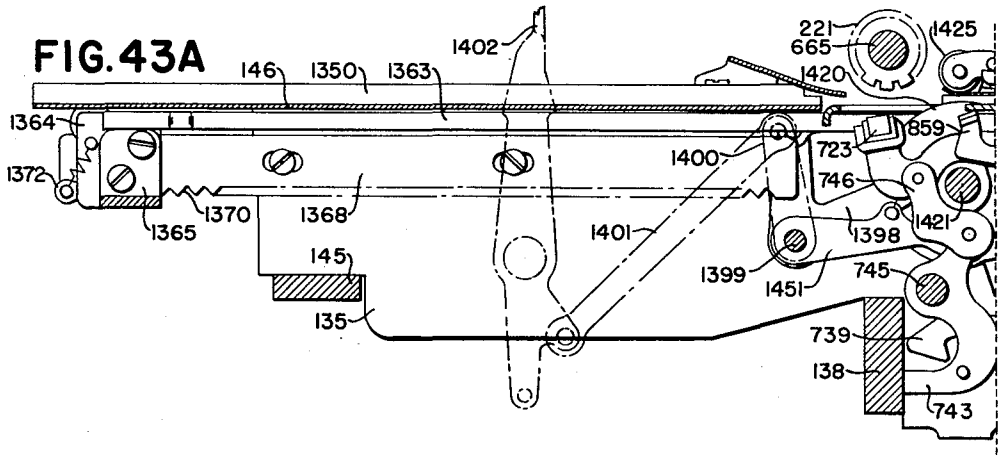

FIG. 44A

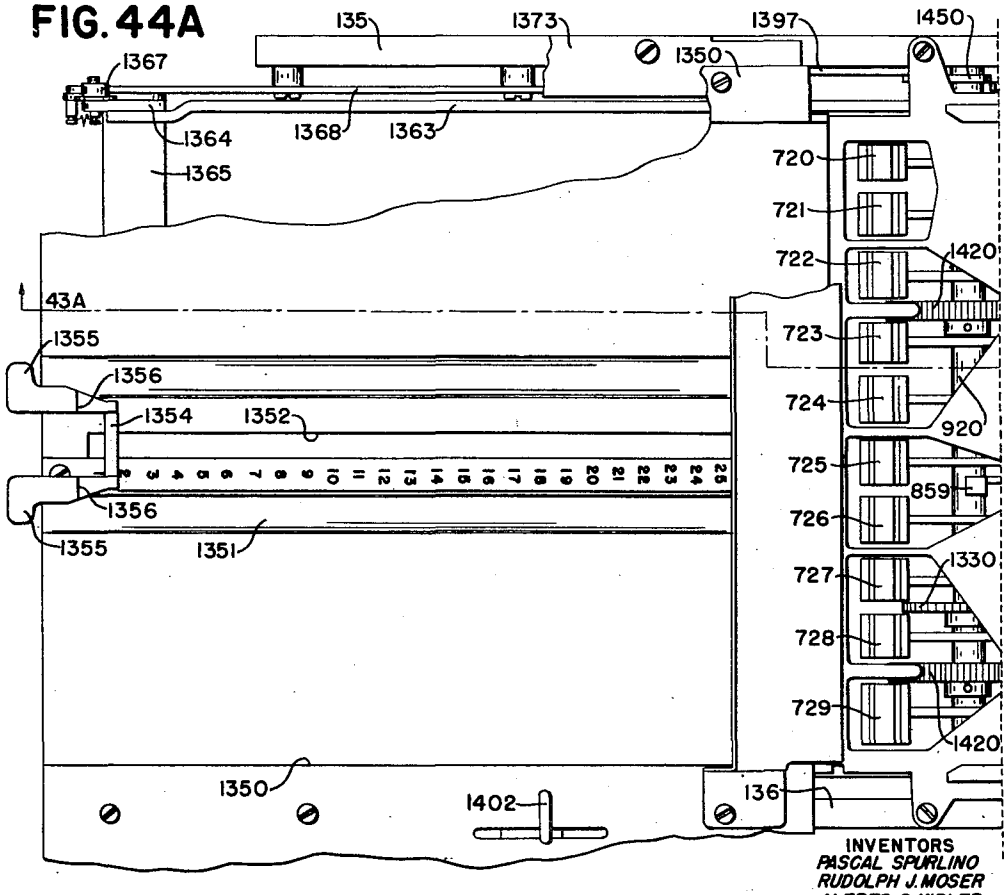

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FIG. 43B

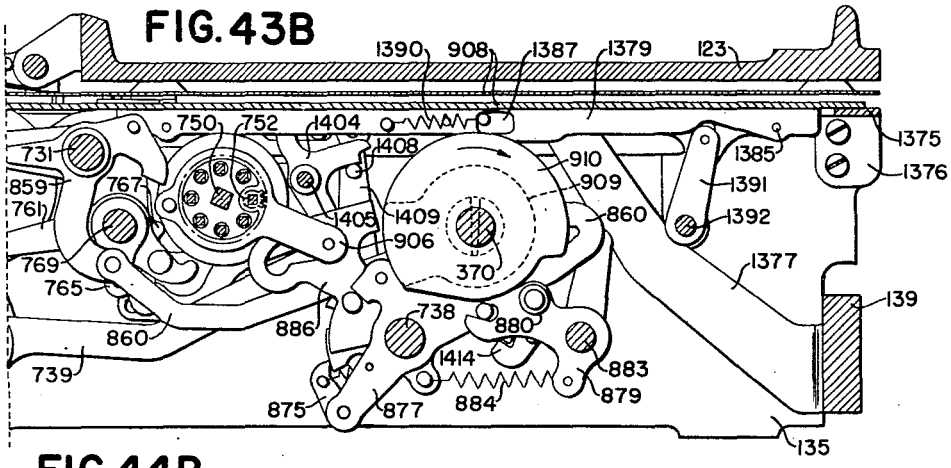
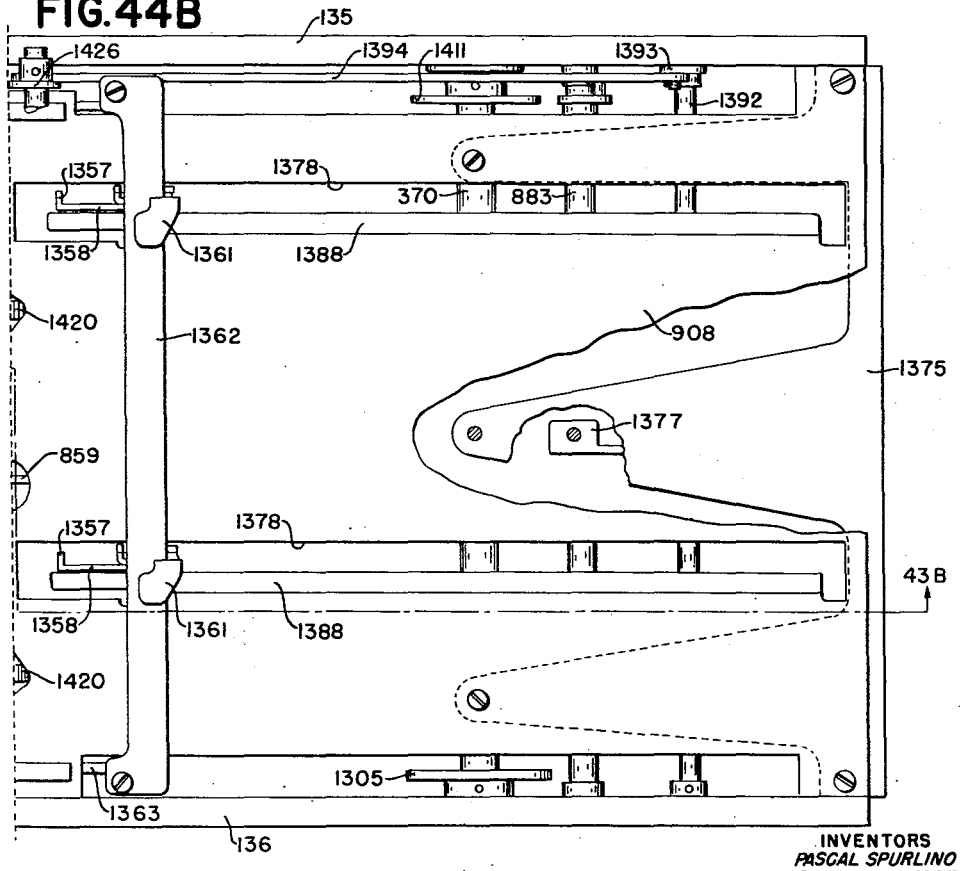


FIG. 44B



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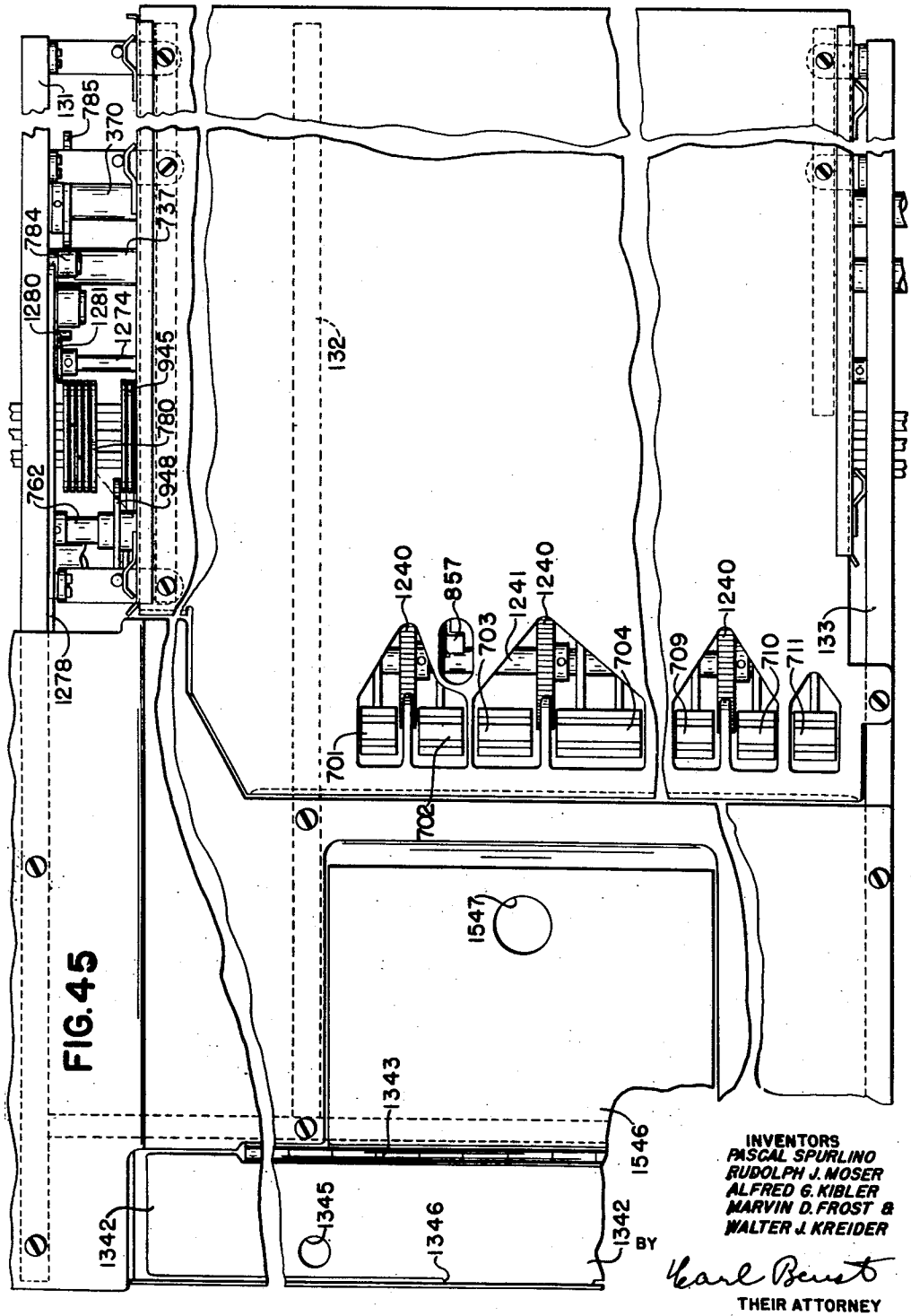

FIG. 45

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FIG. 46A

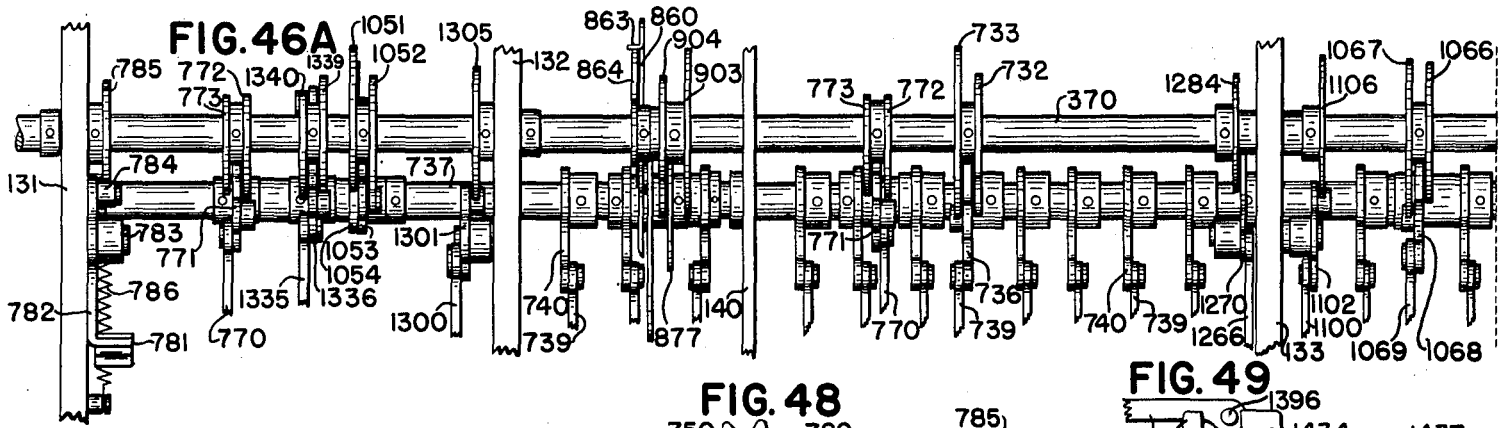


FIG. 47

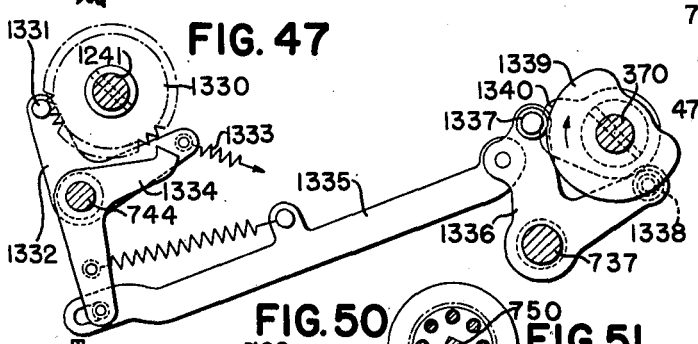


FIG. 48

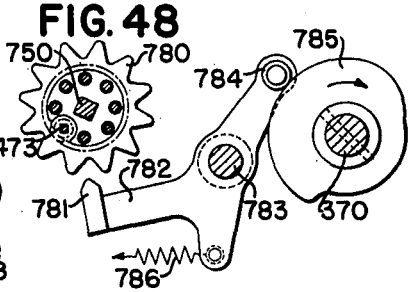


FIG. 49

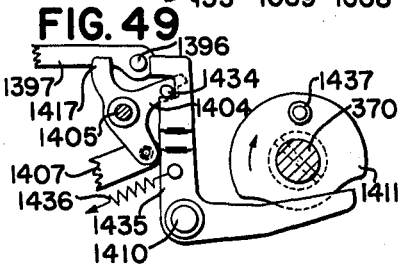


FIG. 50

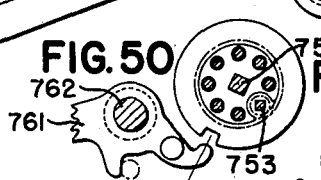
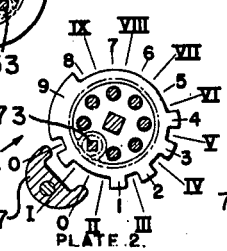


PLATE 1.

FIG. 51



HAMMER 713
PLATE GROUP 813
COLUMN 13

PLATE 2.

FIG. 52

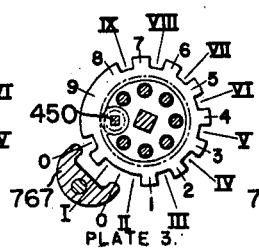


PLATE 3.

FIG. 53

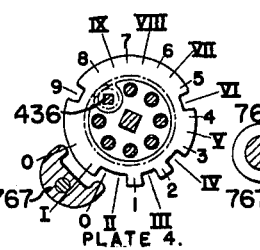


PLATE 4.

FIG. 54

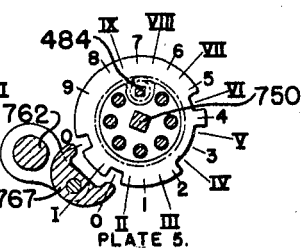


PLATE 5.

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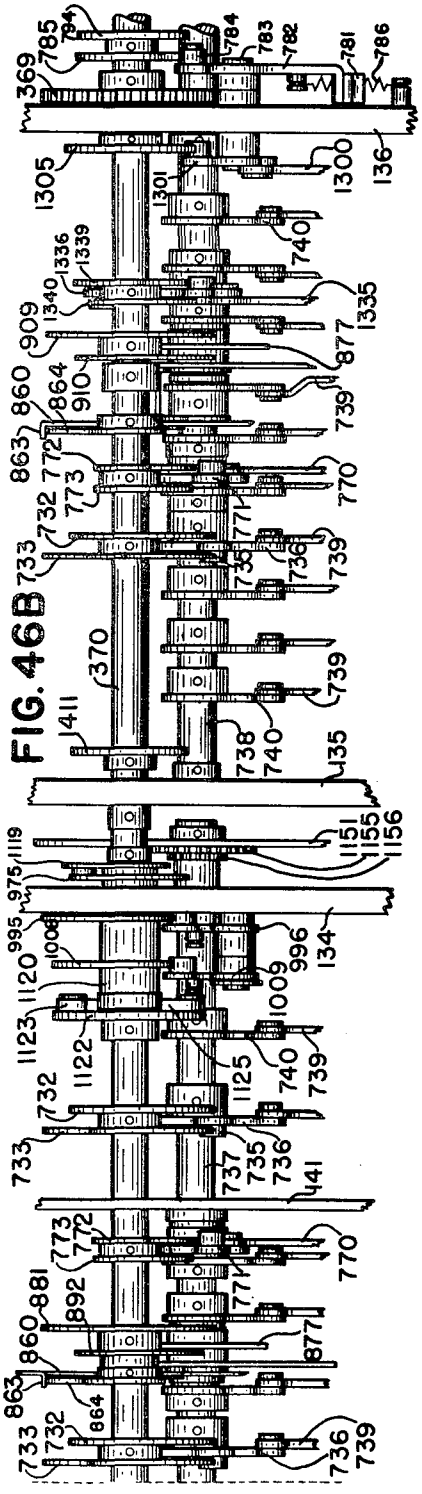

FIG. 46B

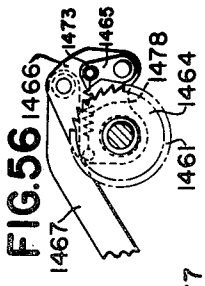

FIG. 56

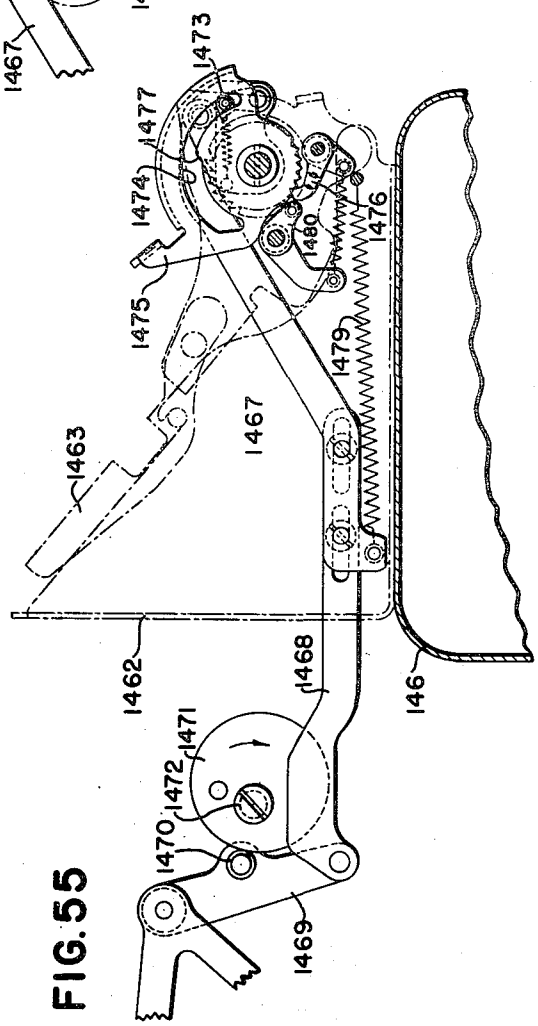

FIG. 55

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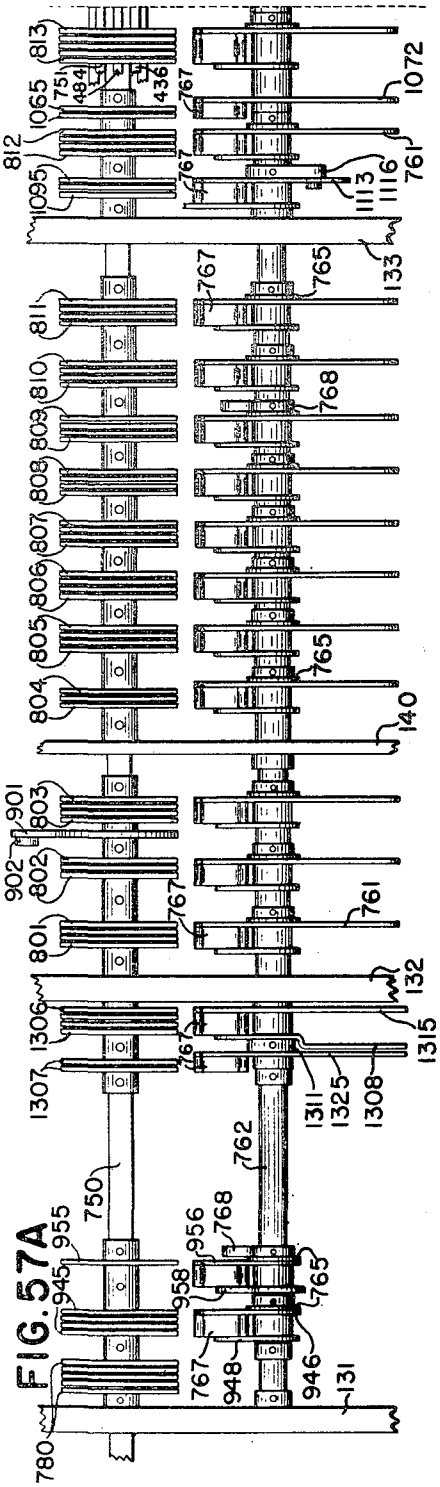

FIG. 57A

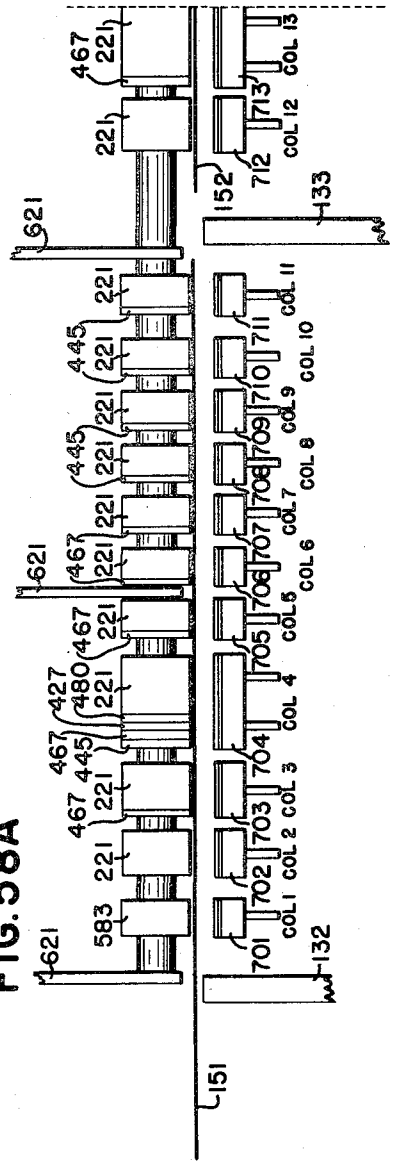

FIG. 58A

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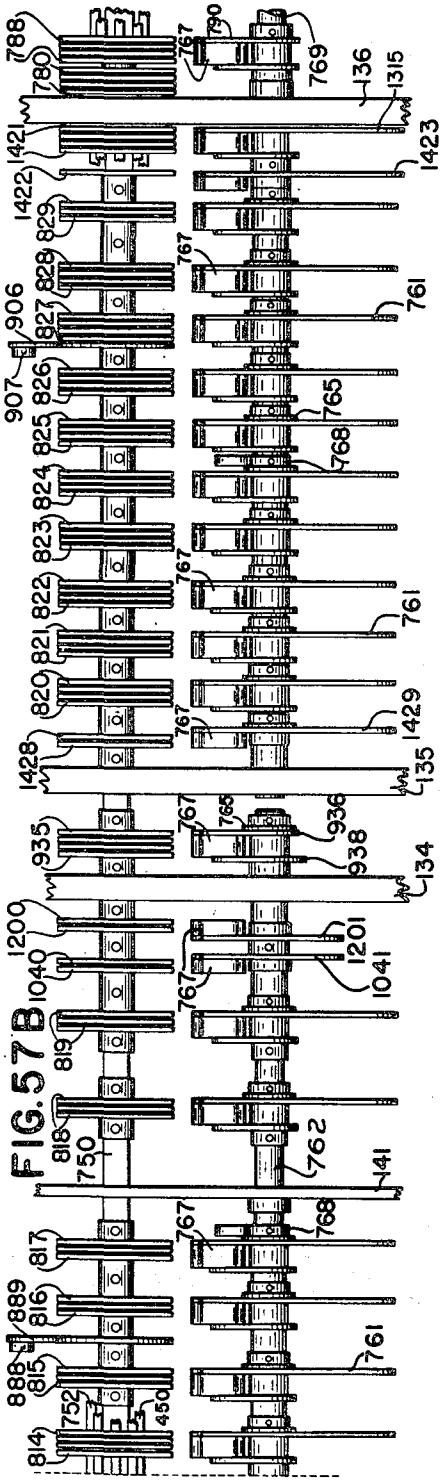

FIG. 57B

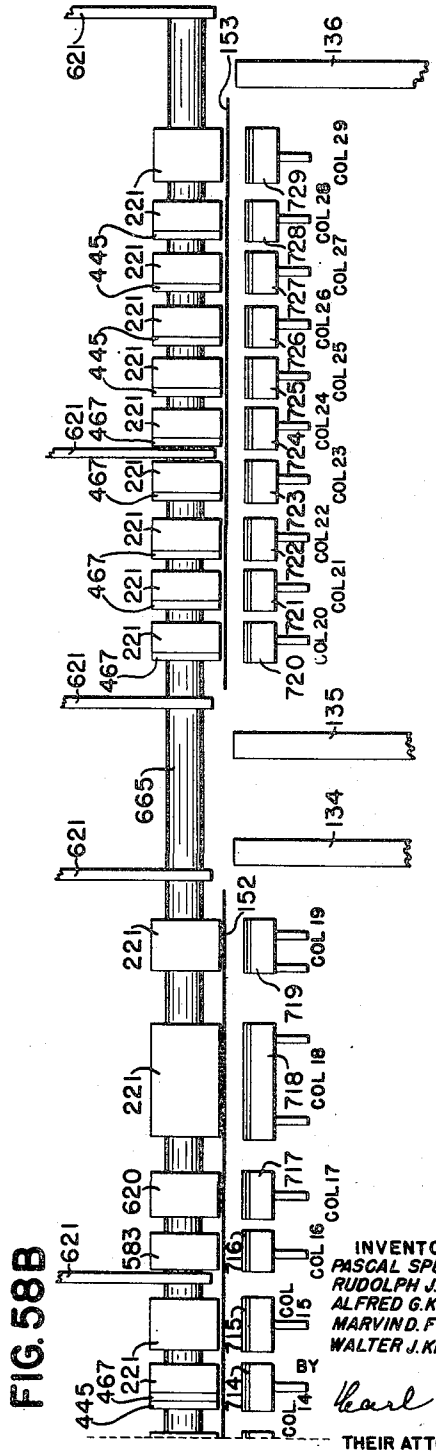

FIG. 58B

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FIG. 59

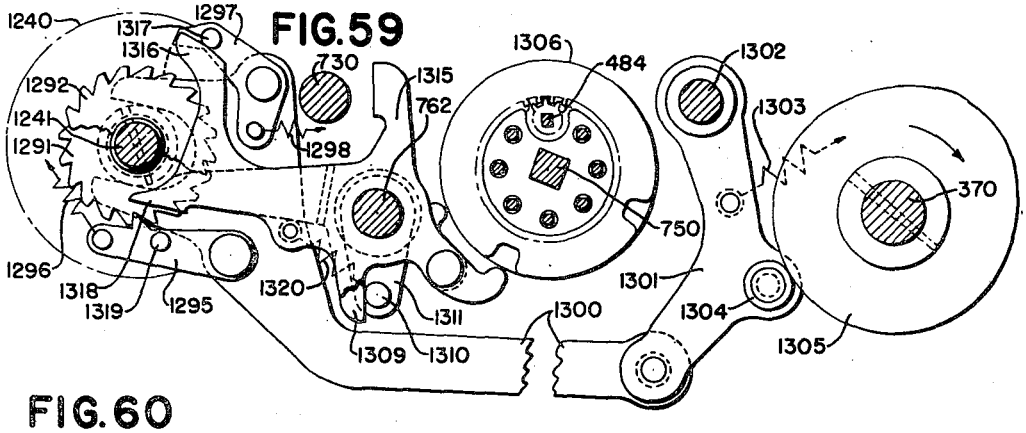

FIG. 60

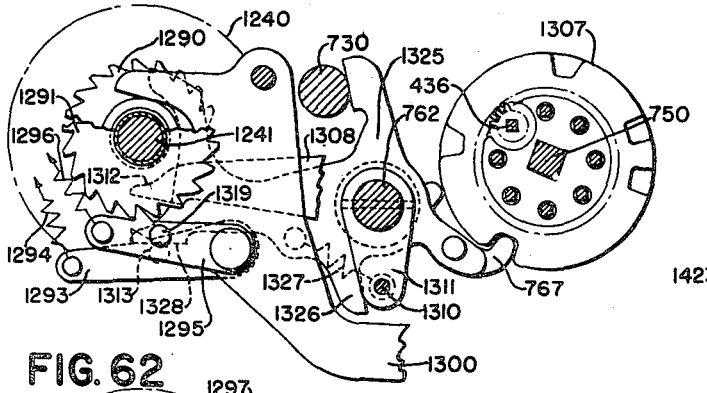

FIG. 61

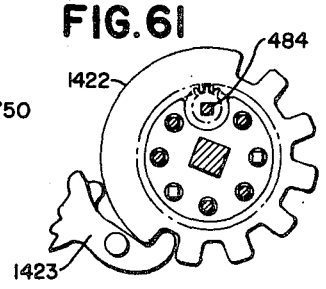

FIG. 62

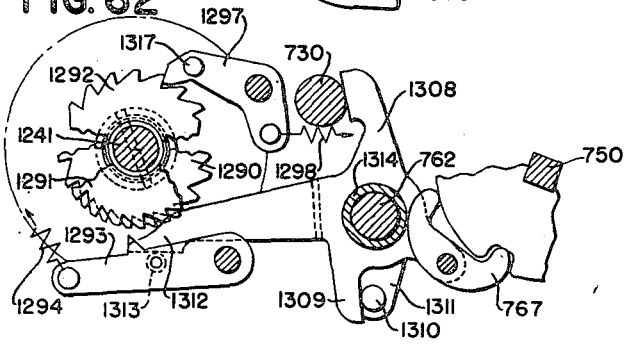

FIG. 63

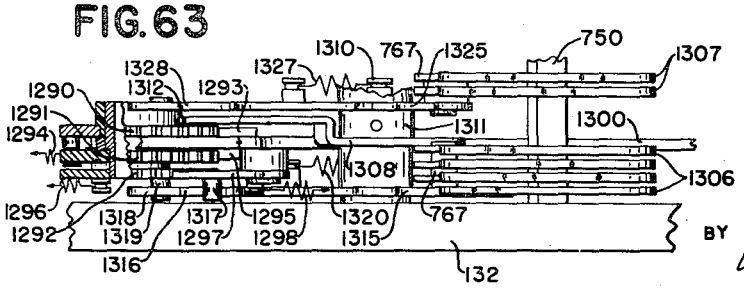

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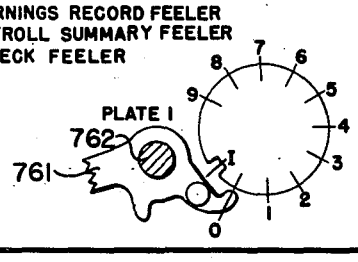
FIG. 64A

SPACE		CONTROLLED BY KEYS IN ROW — PLATE 1 NOTCHES CUT IN			CONTROLLED BY KEYS IN ROW — PLATE 2 NOTCHES CUT IN		
		ARABIC POSITION	ROMAN POSITION	↓	ARABIC POSITION	ROMAN POSITION	↓
1	MACHINE LOCK. PLATE GROUP 945. BY RECORD FEELER AS SHOWN.		I	*	5-6-7-8		4
2	SUM. SPACE LINE FEED. PLATE GR. 1306. NOTCH SEL. TOP & HI. SPOTS BOTTOM LINE.	0-3		1	0-2-4-6-8		4
3	HAMMER 701. PLATE GROUP 801. SUMMARY CONSECUTIVE NO. COL. 1.	0		Δ	0	0	#
4	HAMMER 703. PLATE GROUP 803. SUMMARY HOURS COL. 3.	0		Δ	7-8-9	ALL	4
5	HAMMER 704. PLATE GROUP 804. SUMMARY AMOUNT COL. 4.	PLATE	OMITTED		7-8-9	ALL	4
6	HAMMER 705. PLATE GROUP 805. SUMMARY EARNINGS COL. 5.	0		Δ	5-6		4
7	HAMMER 706. PLATE GROUP 806. SUMMARY DEDUCTIONS COL. 6	0		Δ	3-4		4
8	HAMMER 707. PLATE GROUP 807. SUMMARY DEDUCTIONS COL. 7.	0		Δ	1-2		4
9	HAMMER 708. PLATE GROUP 808. SUMMARY DEDUCTIONS COL. 8.	0		Δ	8-9		3
10	HAMMER 709. PLATE GROUP 809. SUMMARY DEDUCTIONS COL. 9.	0		Δ	6-7		3
11	HAMMER 710. PLATE GROUP 810. SUMMARY DEDUCTIONS COL. 10.	0		Δ	4-5		3
12	HAMMER 711. PLATE GROUP 811. SUMMARY DEDUCTIONS COL. 11.	0		Δ	1-2-3		3
13	HAMMER 712. PLATE GROUP 812. CHECK HOURS COL. 12.	0		#	7-8	ALL	4
14	HAMMER 714. PLATE GROUP 814. CHECK DEDUCTIONS COL. 14.	0		#	0-1-2-3-4		4
15	MACHINE LOCK. PLATE GROUP 935. BY CHECK FEELER.	0		LEVER		I	#
16	HAMMER 720. PLATE GROUP 820. RECORD HOURS COL. 20.	0		*	7-8		4
17	HAMMER 721. PLATE GROUP 821. RECORD EARNINGS COL. 21.	0		*	7-8		4
18	HAMMER 722. PLATE GROUP 822. LEDGER EARNINGS COL. 22.	0		*	5-6		4
19	HAMMER 723. PLATE GROUP 823. RECORD DEDUCTIONS COL. 23.	0		*	3-4		4
20	HAMMER 724. PLATE GROUP 824. RECORD DEDUCTIONS COL. 24.	0		*	1-2		4
21	HAMMER 725. PLATE GROUP 825. RECORD DEDUCTIONS COL. 25.	0		*	8-9		3
22	HAMMER 726. PLATE GROUP 826. RECORD DEDUCTIONS COL. 26.	0		*	6-7		3
23	HAMMER 727. PLATE GROUP 827. RECORD DEDUCTIONS COL. 27.	0		*	4-5		3
24	HAMMER 728. PLATE GROUP 828. RECORD DEDUCTIONS COL. 28.	0		*	1-2-3		3
25	REC. SPACE LINE FEED. PLATE GR. 1421. NOTCH SEL. TOP & HI. SPOTS BOTTOM LINE.	0-1-3		1	0-2-4-6-8	IX	4
26	PLATE GROUP 788. CONSECUTIVE NO. ADVANCE.	0-1		LEVER	0	0	#

* EARNINGS RECORD FEELER
Δ PAYROLL SUMMARY FEELER
CHECK FEELER



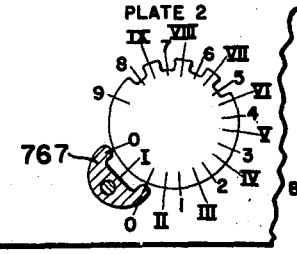


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FIG. 64B

CONTROLLED BY KEYS IN ROW — PLATE 3 NOTCHES CUT IN			CONTROLLED BY KEYS IN ROW — PLATE 4 NOTCHES CUT IN				
ARABIC POSITION	ROMAN POSITION	↓	ARABIC POSITION	ROMAN POSITION	↓		SPACE
9		2	0		1	MACHINE LOCK. PLATE GROUP 945. BY RECORD FEELER AS SHOWN.	1
0-3-5-7-9		3	5-6-7-8-9	IX	2	SUM. SPACE LINE FEED. PLATE GR. 1306. NOTCH SEL. TOP & HI. SPOTS BOTTOM LINE.	2
2-3-4-9	II-IV-IX	2	0-6	I-IV-V	1	HAMMER 701. PLATE GROUP 801. SUMMARY CONSECUTIVE NO. COL. 1.	3
6-9	0-II-III-IV	2	0-6	0-IV-V-VI	1	HAMMER 703. PLATE GROUP 803. SUMMARY HOURS COL. 3.	4
6-9	0-II-III-IV	2	0-6	0-IV-V-VI	1	HAMMER 704. PLATE GROUP 804. SUMMARY AMOUNT COL. 4.	5
6-9		2	0		1	HAMMER 705. PLATE GROUP 805. SUMMARY EARNINGS COL. 5.	6
5-8		2	0		1	HAMMER 706. PLATE GROUP 806. SUMMARY DEDUCTIONS COL. 6.	7
5-8		2	0		1	HAMMER 707. PLATE GROUP 807. SUMMARY DEDUCTIONS COL. 7.	8
5-8		2	0		1	HAMMER 708. PLATE GROUP 808. SUMMARY DEDUCTIONS COL. 8.	9
5-8		2	0		1	HAMMER 709. PLATE GROUP 809. SUMMARY DEDUCTIONS COL. 9.	10
5-8		2	0		1	HAMMER 710. PLATE GROUP 810. SUMMARY DEDUCTIONS COL. 10.	11
5-8		2	0		1	HAMMER 711. PLATE GROUP 811. SUMMARY DEDUCTIONS COL. 11.	12
9	0-II III IV	2	0	0-IV-V-VI	1	HAMMER 712. PLATE GROUP 812. CHECK HOURS COL. 12.	13
5-8		2	0		1	HAMMER 714. PLATE GROUP 814. CHECK DEDUCTIONS COL. 14.	14
1		2	0		1	MACHINE LOCK. PLATE GROUP 935. BY CHECK FEELER	15
9		2	0		1	HAMMER 720. PLATE GROUP 820. RECORD HOURS COL. 20.	16
9		2	0		1	HAMMER 721. PLATE GROUP 821. RECORD EARNINGS COL. 21.	17
9		2	0		1	HAMMER 722. PLATE GROUP 822. LEDGER EARNINGS COL. 22.	18
5		2	0		1	HAMMER 723. PLATE GROUP 823. RECORD DEDUCTIONS COL. 23.	19
5		2	0		1	HAMMER 724. PLATE GROUP 824. RECORD DEDUCTIONS COL. 24.	20
5		2	0		1	HAMMER 725. PLATE GROUP 825. RECORD DEDUCTIONS COL. 25.	21
5		2	0		1	HAMMER 726. PLATE GROUP 826. RECORD DEDUCTIONS COL. 26.	22
5		2	0		1	HAMMER 727. PLATE GROUP 827. RECORD DEDUCTIONS COL. 27.	23
5		2	0		1	HAMMER 728. PLATE GROUP 828. RECORD DEDUCTIONS COL. 28.	24
0-3-5-7-9	0	3	1-5-6-7-8-9	IX	2	REC. SPACE LINE FEED. PLATE GR. 1421. NOTCH SEL. TOP & HI. SPOTS BOTTOM LINE.	25
2-3-4	II-IV-IX	2	0-6	I-IV-V	1	PLATE GROUP 788. CONSECUTIVE NO. ADVANCE	26

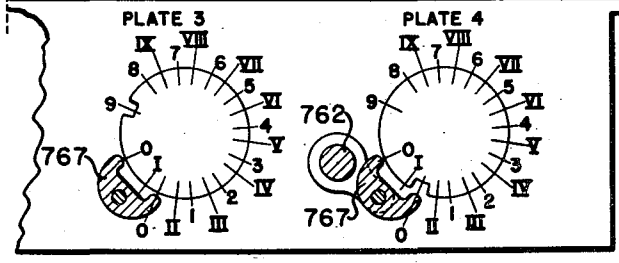

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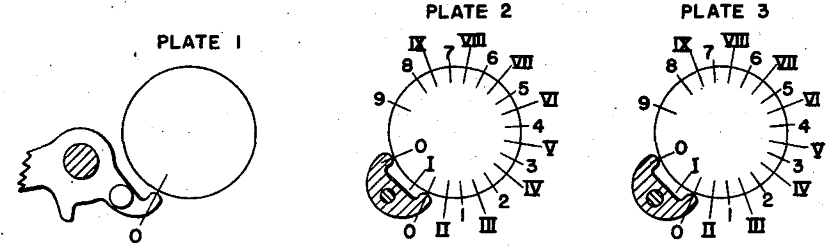
FIG. 65

SPACE		CONTROLLED BY KEYS IN ROW		↓	CONTROLLED BY KEYS IN ROW		↓	CONTROLLED BY KEYS IN ROW		↓
		PLATE 1 NOTCHES CUT IN			PLATE 2 NOTCHES CUT IN			PLATE 3 NOTCHES CUT IN		
		ARABIC POSITION	ROMAN POSITION		ARABIC POSITION	ROMAN POSITION		ARABIC POSITION	ROMAN POSITION	
1	SUMMARY FEED. HIGH SPOTS FEED. PLATE GROUP 1307.	PLATE	OMITTED		0-9	V-VI-VIII	2	0-2-3	0-I-II-III	1
2	CHECK BACK SPACE TO 1ST. DEDUCTION. HIGH POINTS CONTROL. PLATE GR. 1065.	PLATE	OMITTED		0-1-2-3-4 5-6-7-8		2	0-1-2-4-5 6-7-8-9		1
3	CHECK FEED. PLATE GROUP 1040.	PLATE	OMITTED			0-V-VI-VIII-IX	2		0	1
4	CHECK EJECTION. PLATE GROUP 1200.	PLATE	OMITTED		2-3-4	II-IV-IX	2	0-6	0-I-IV-V	1
5	EARNINGS RECORD TENSION RELEASE. PLATE GROUP 1428.	PLATE	OMITTED			IX	2		I-II	1
6	HAMMER 702. PLATE GROUP 802. SUMMARY, GROSS & NET. COL. 2.	0		△	9		2	1-3		1
7	NET PAY PRINTING POSITION ON CHECK. PLATE GROUP 1095.	0		#	9		2	1		1
8	HAMMER 715. PLATE GROUP 815. CHECK STUB, NET PAY. COL. 15.	0		#		IX	2		I	1
9	HAMMER 716. PLATE GROUP 816. CHECK, CONSECUTIVE NO. COL. 16.	0		#	1	II-III-IV	2	0	0-IV-V-VI	1
10	HAMMER 717. PLATE GROUP 817. CHECK, DATE. COL. 17.	0		#	1	II-III-IV	2	0	0-IV-V-VI	1
11	HAMMER 718. PLATE GROUP 818. CHECK, NET PAY. COL. 18	0		#		IX	2	0	I	1
12	HAMMER 719. PLATE GROUP 819. CHECK, NET PAY. COL. 19.	0		#		IX	2	0	I	1
13	HAMMER 729. PLATE GROUP 829. RECORD, GROSS & EARNINGS TO DATE. COL. 29.	0		*	9		2	2-3		1

* EARNINGS RECORD FEELER

△ PAYROLL SUMMARY FEELER

CHECK FEELER.



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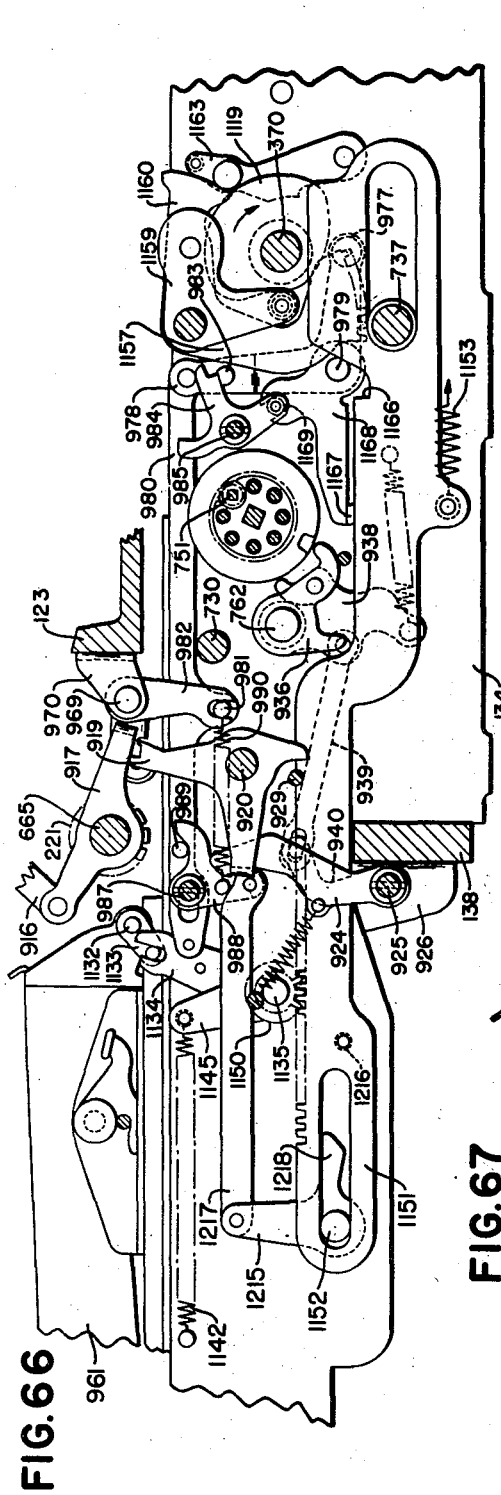

FIG. 66

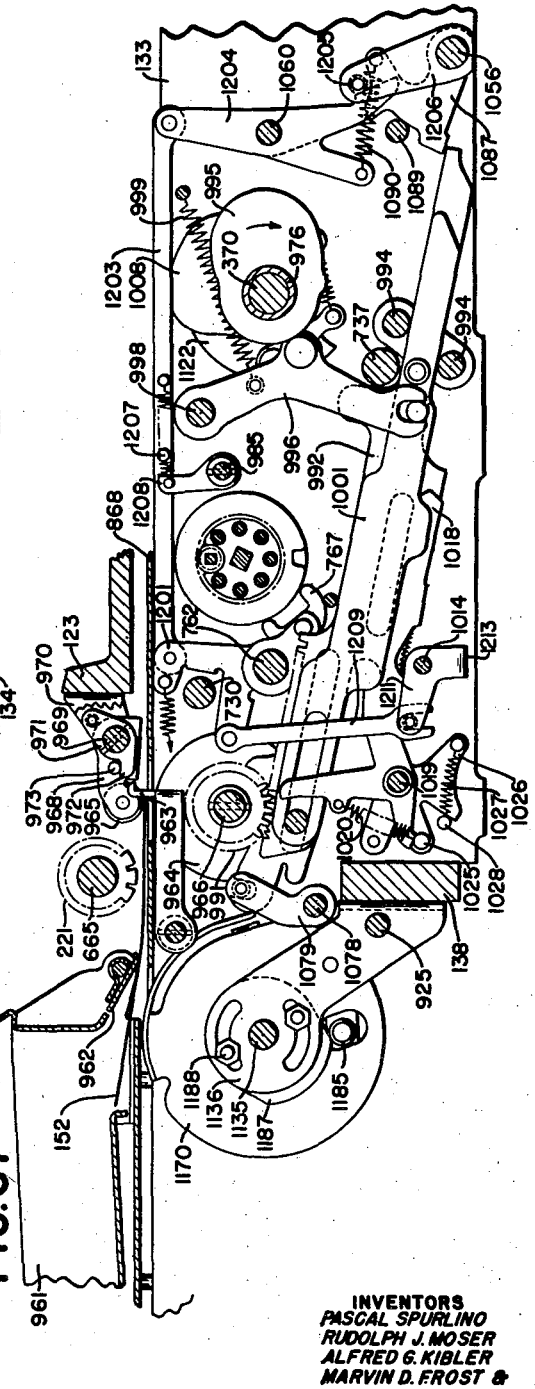

FIG. 67

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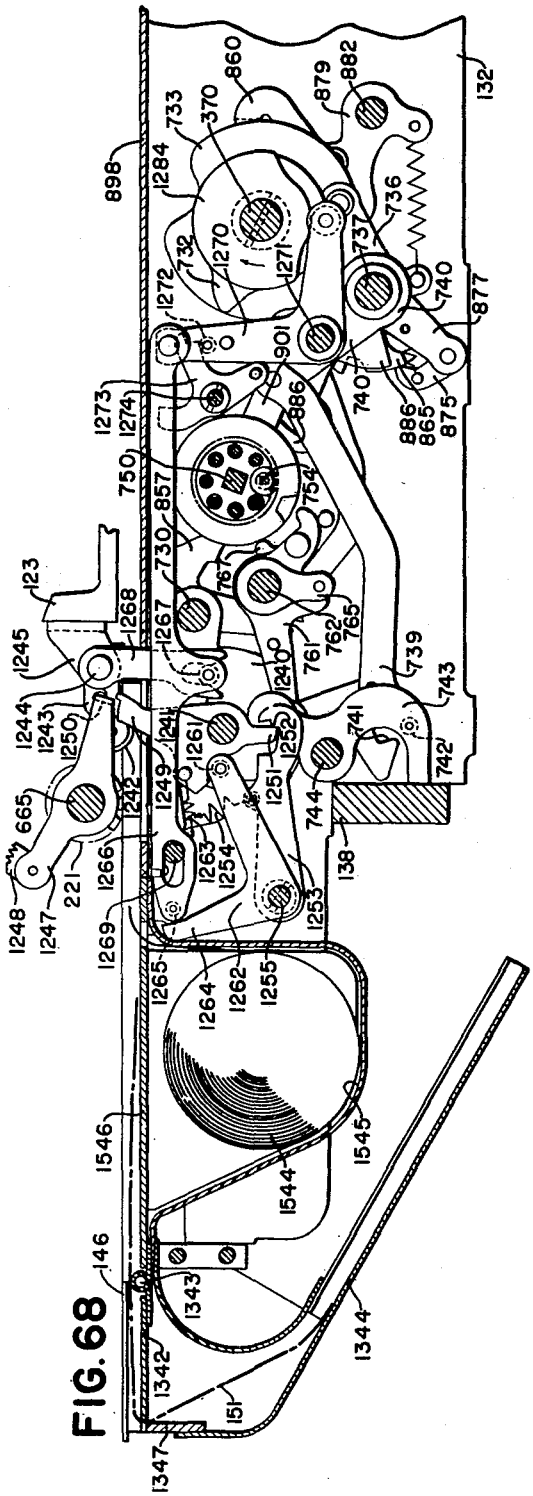

FIG. 68

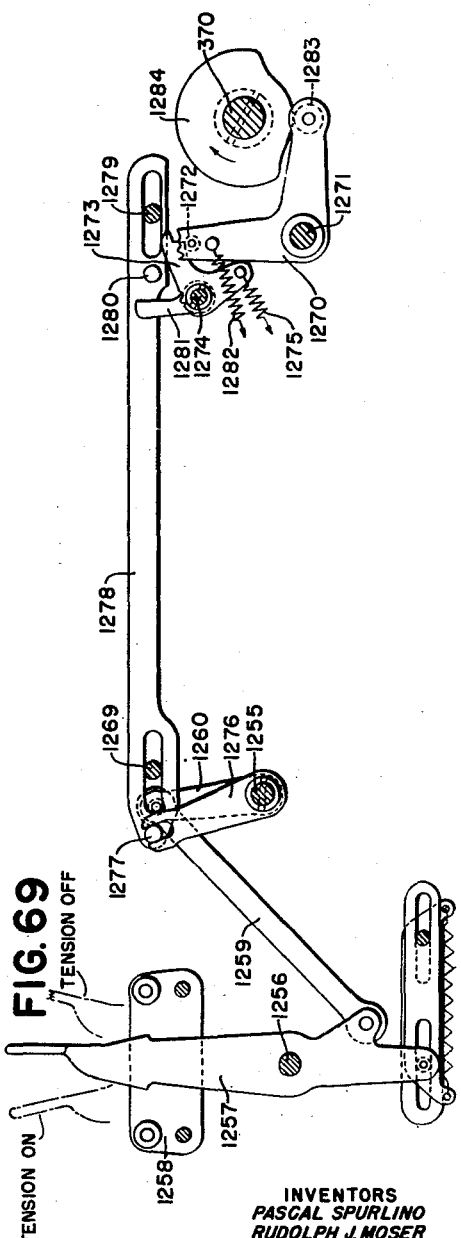

FIG. 69

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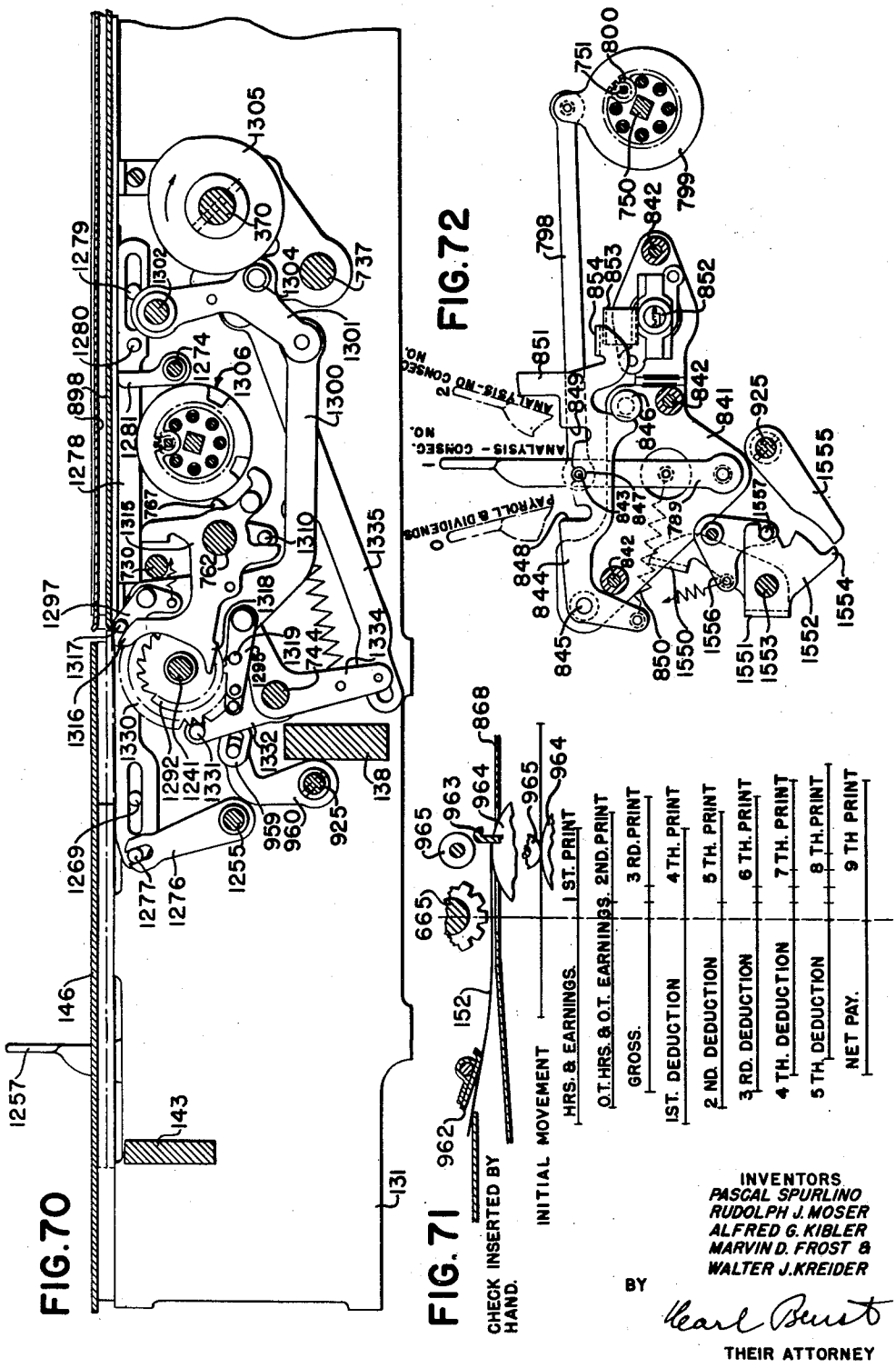

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April 19, 1949. P. SPURLINO ET AL 2,467,704

ACCOUNTING MACHINE

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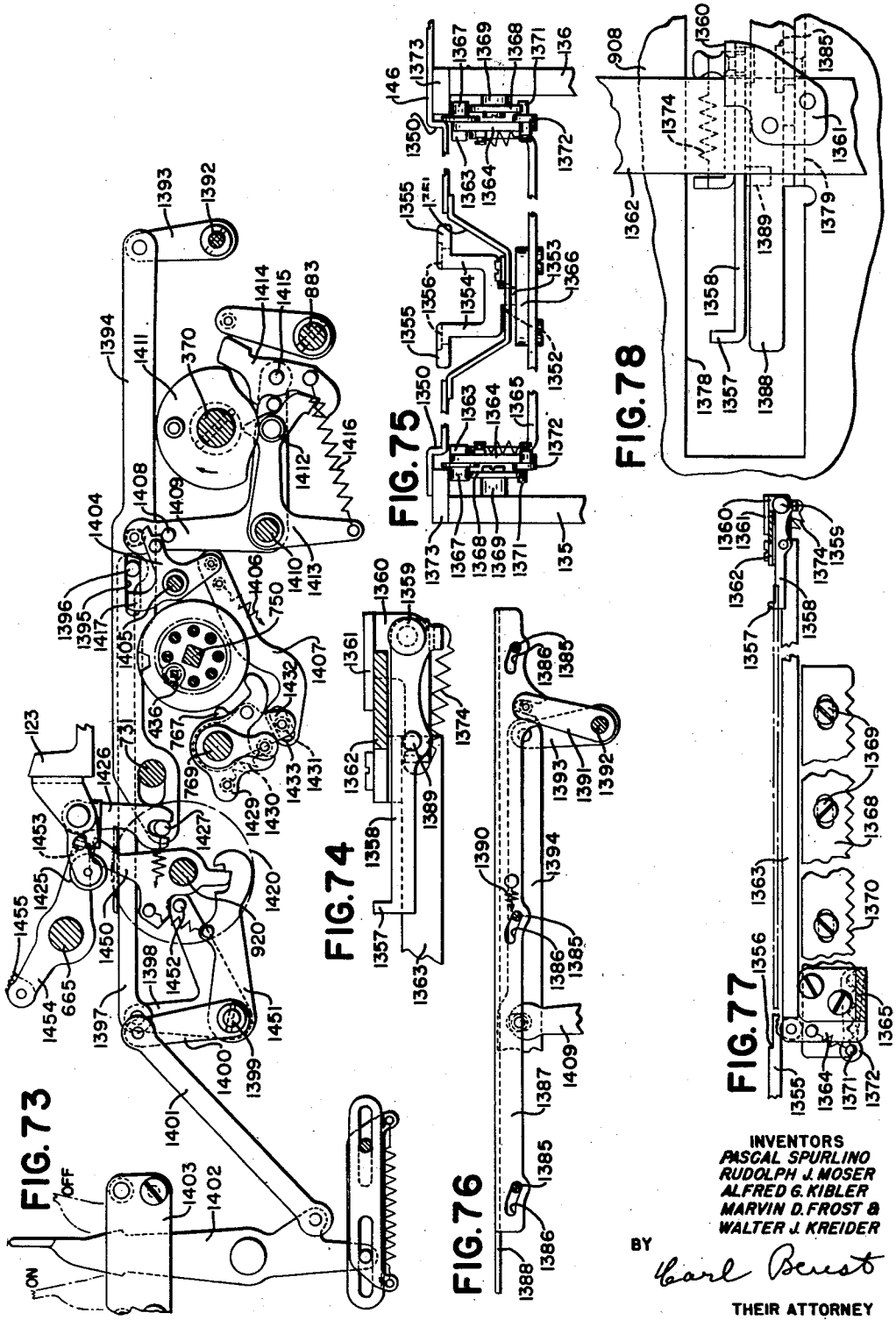

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ACCOUNTING MACHINE

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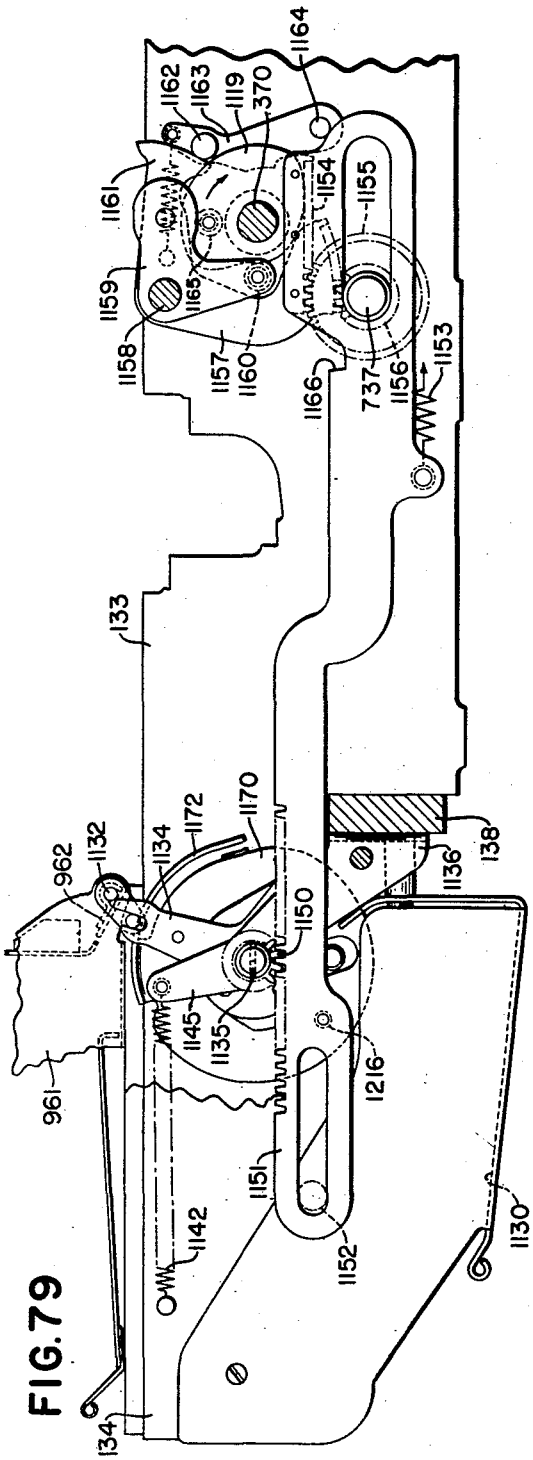

FIG. 79

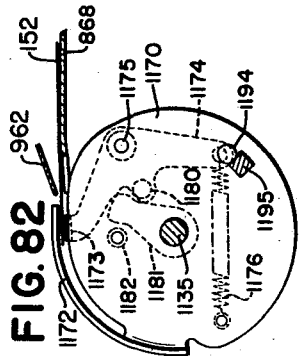

FIG. 82

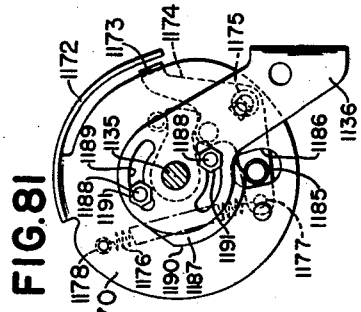

FIG. 81

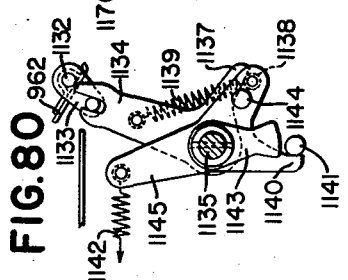

FIG. 80

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FIG. 83

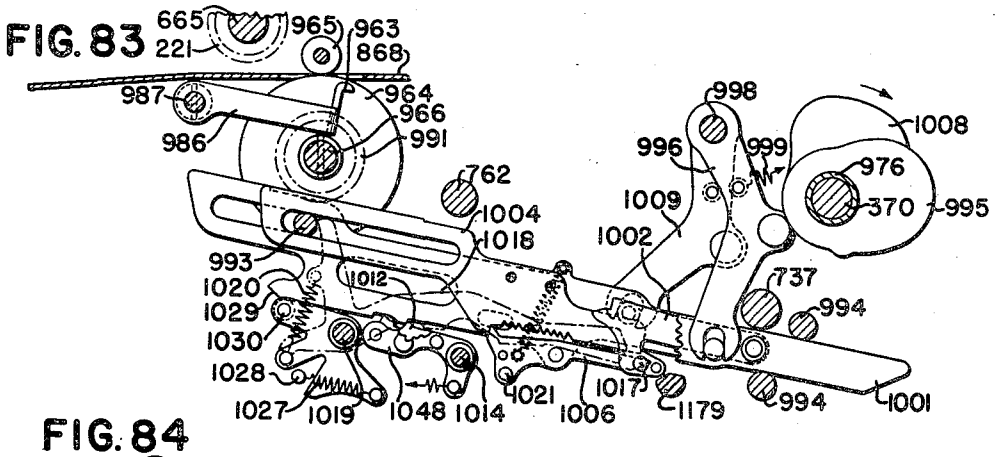

FIG. 84

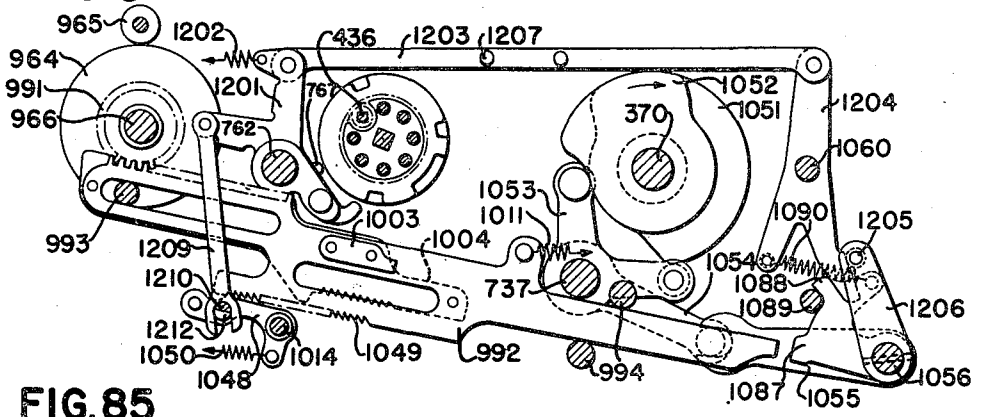

FIG. 85

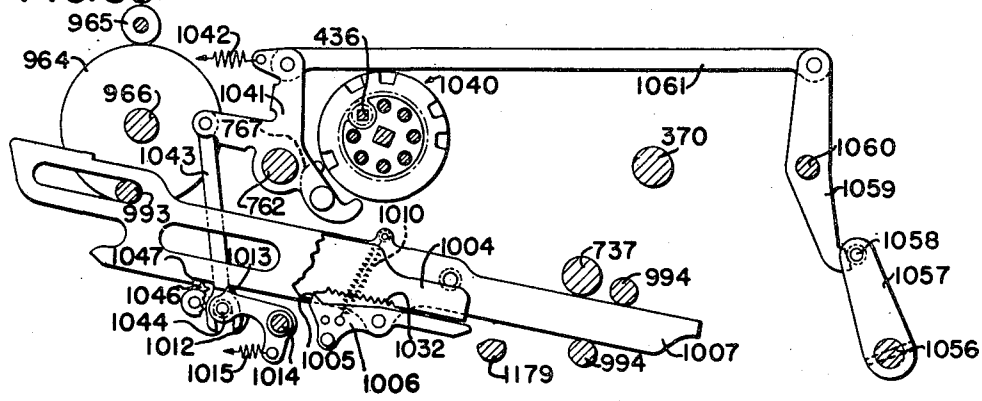

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FIG. 86

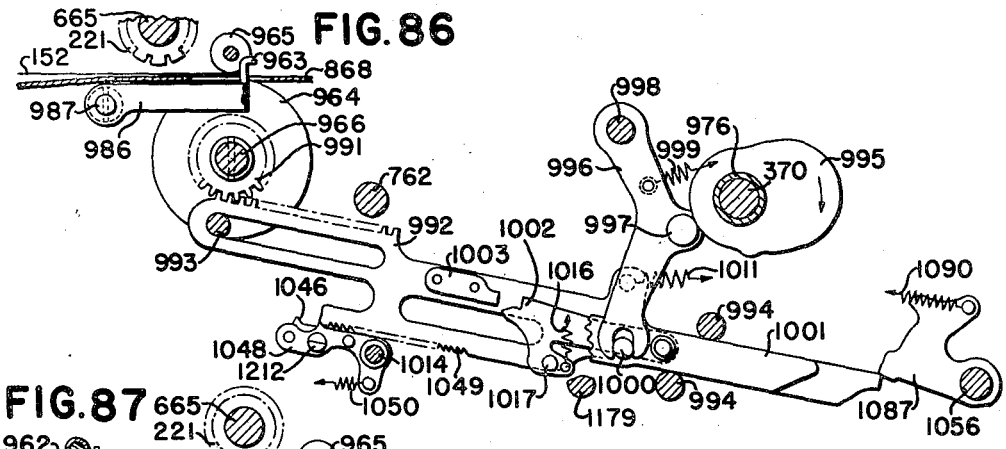


FIG. 87

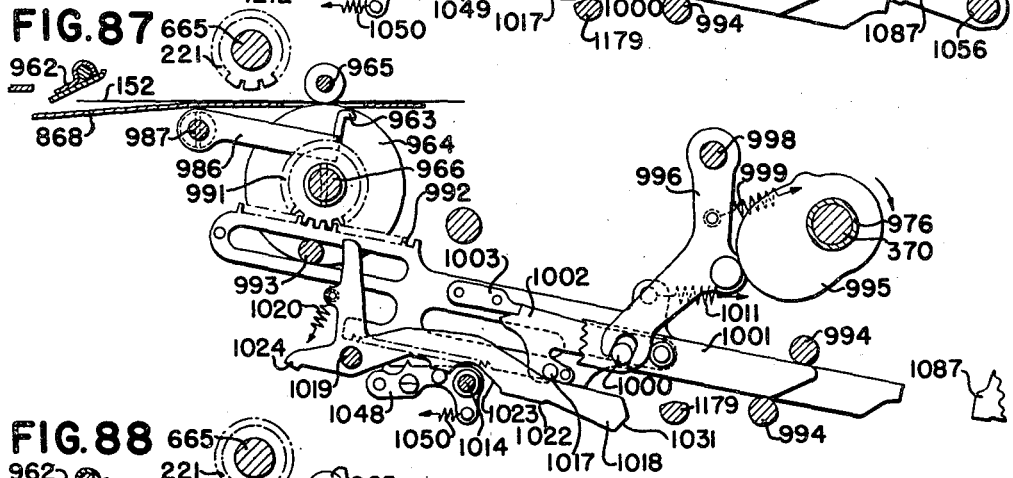
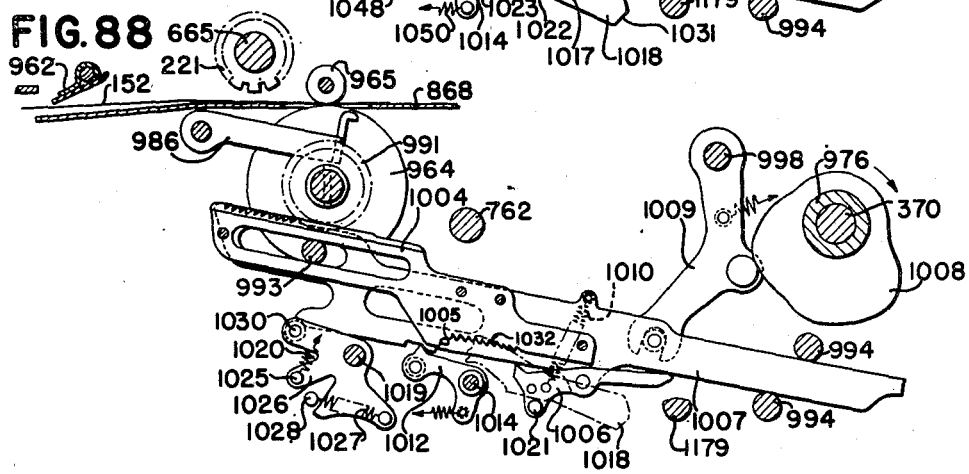


FIG. 88



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ACCOUNTING MACHINE

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FIG. 89

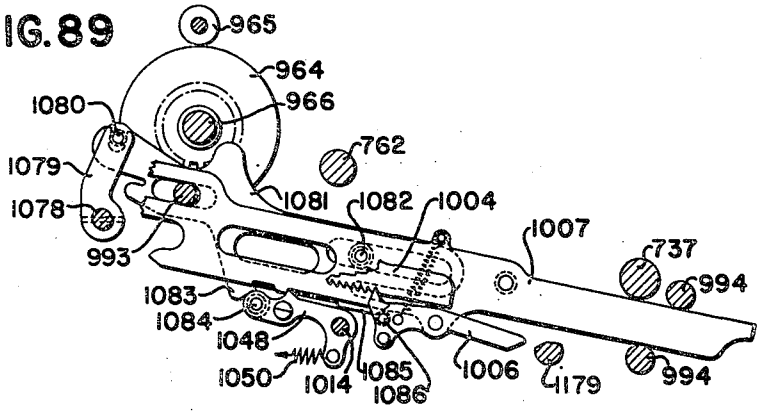


FIG. 90

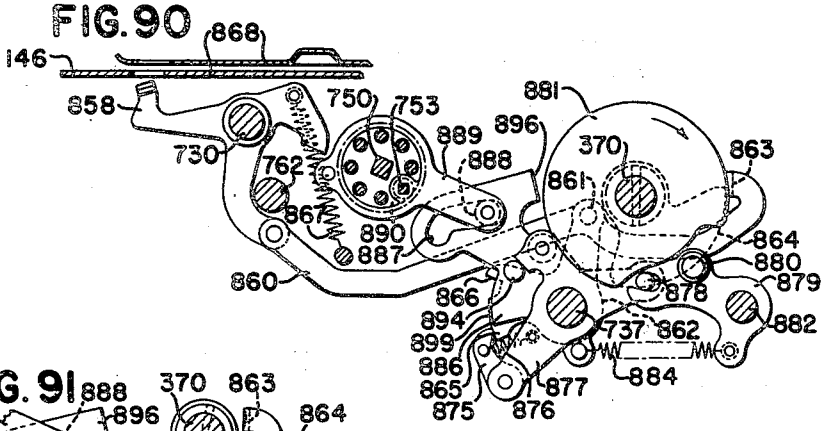


FIG. 91

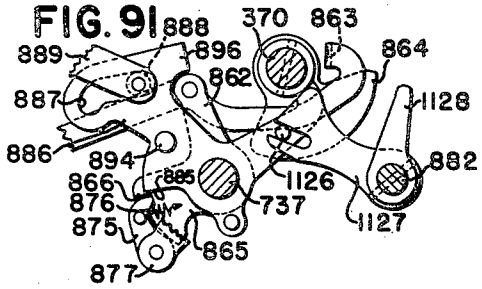


FIG. 92

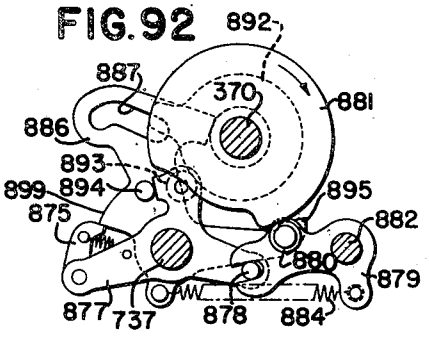


FIG. 93

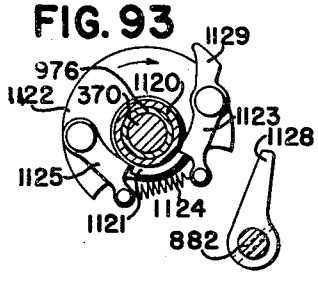
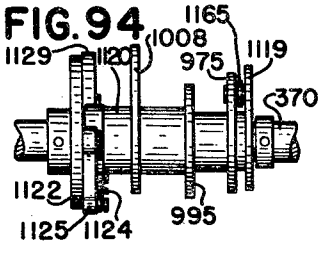


FIG. 94



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ACCOUNTING MACHINE

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FIG. 95

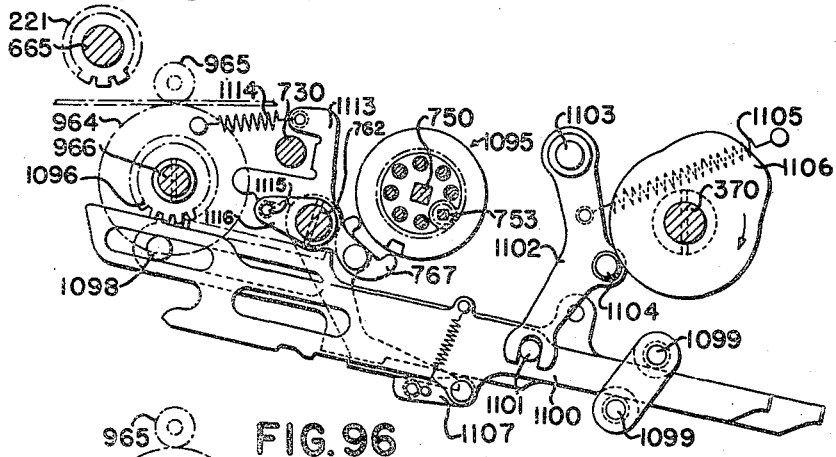

FIG. 96

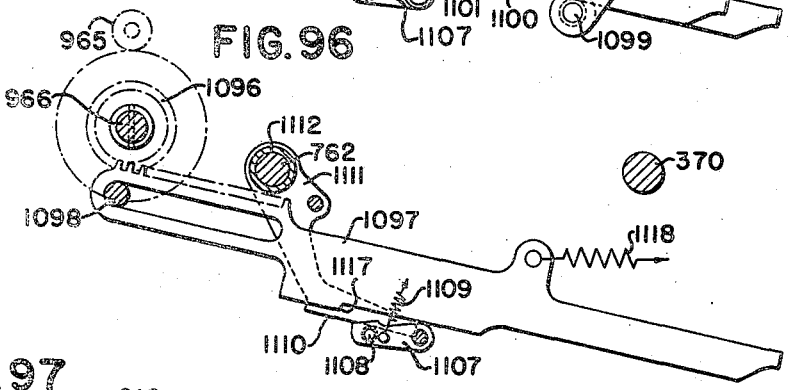

FIG. 97

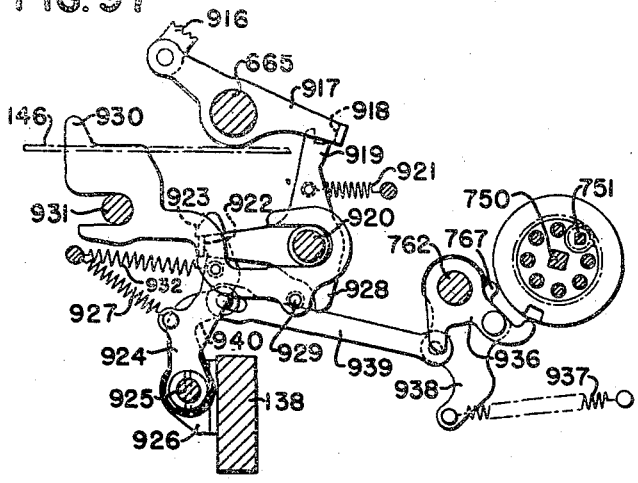

FIG. 98

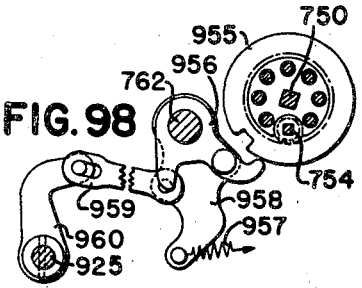

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FIG.99

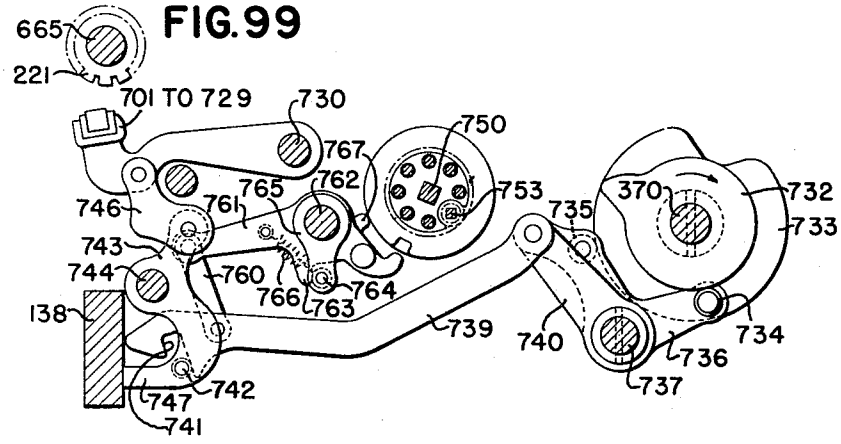

FIG.100

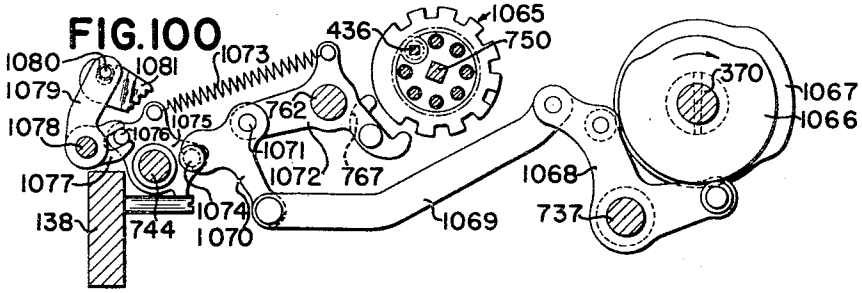

FIG.101

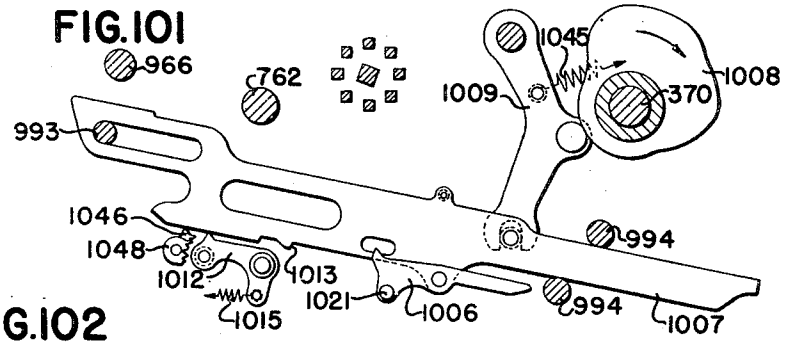

FIG.102

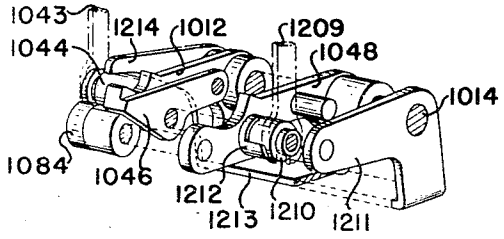

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FIG.103

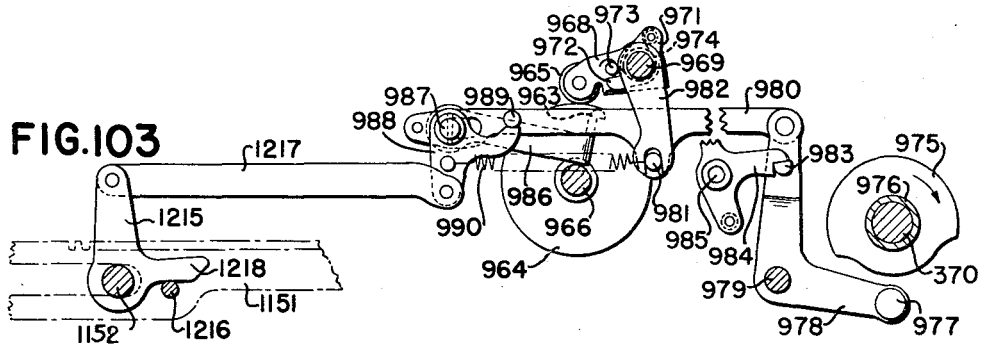


FIG.104

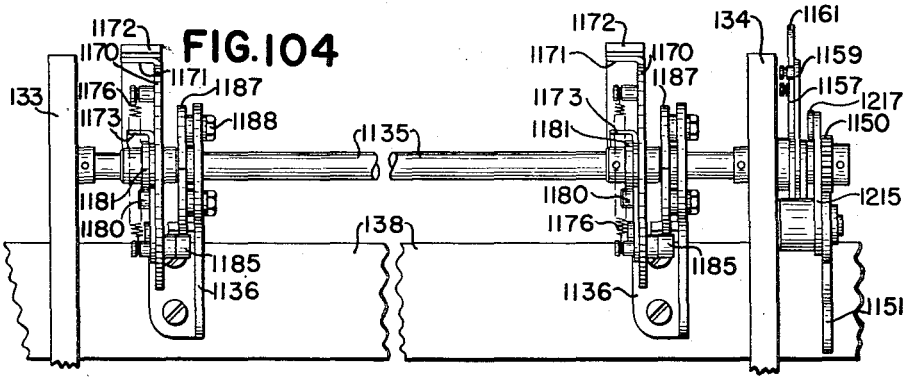
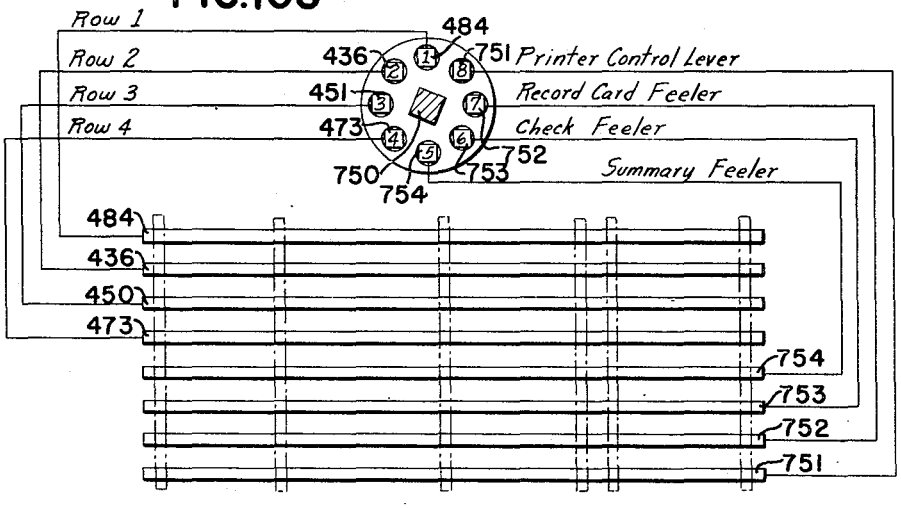


FIG.105



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ACCOUNTING MACHINE

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FIG.106

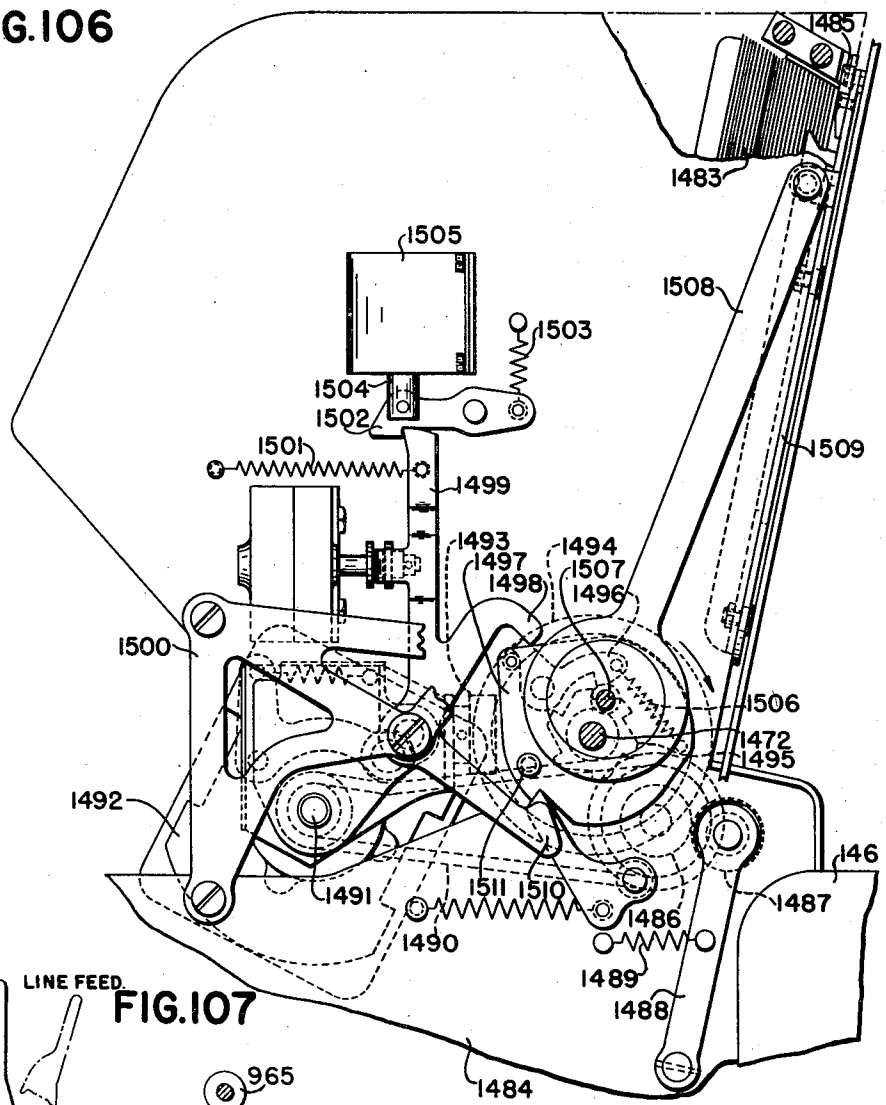


FIG.107

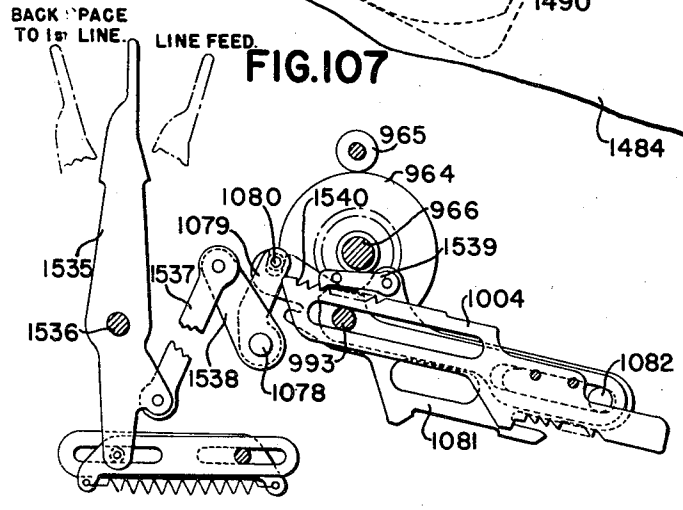
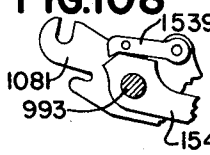


FIG.108



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April 19, 1949. P. SPURLINO ET AL 2,467,704

ACCOUNTING MACHINE

Filed Dec. 28, 1943 40 Sheets-Sheet 40

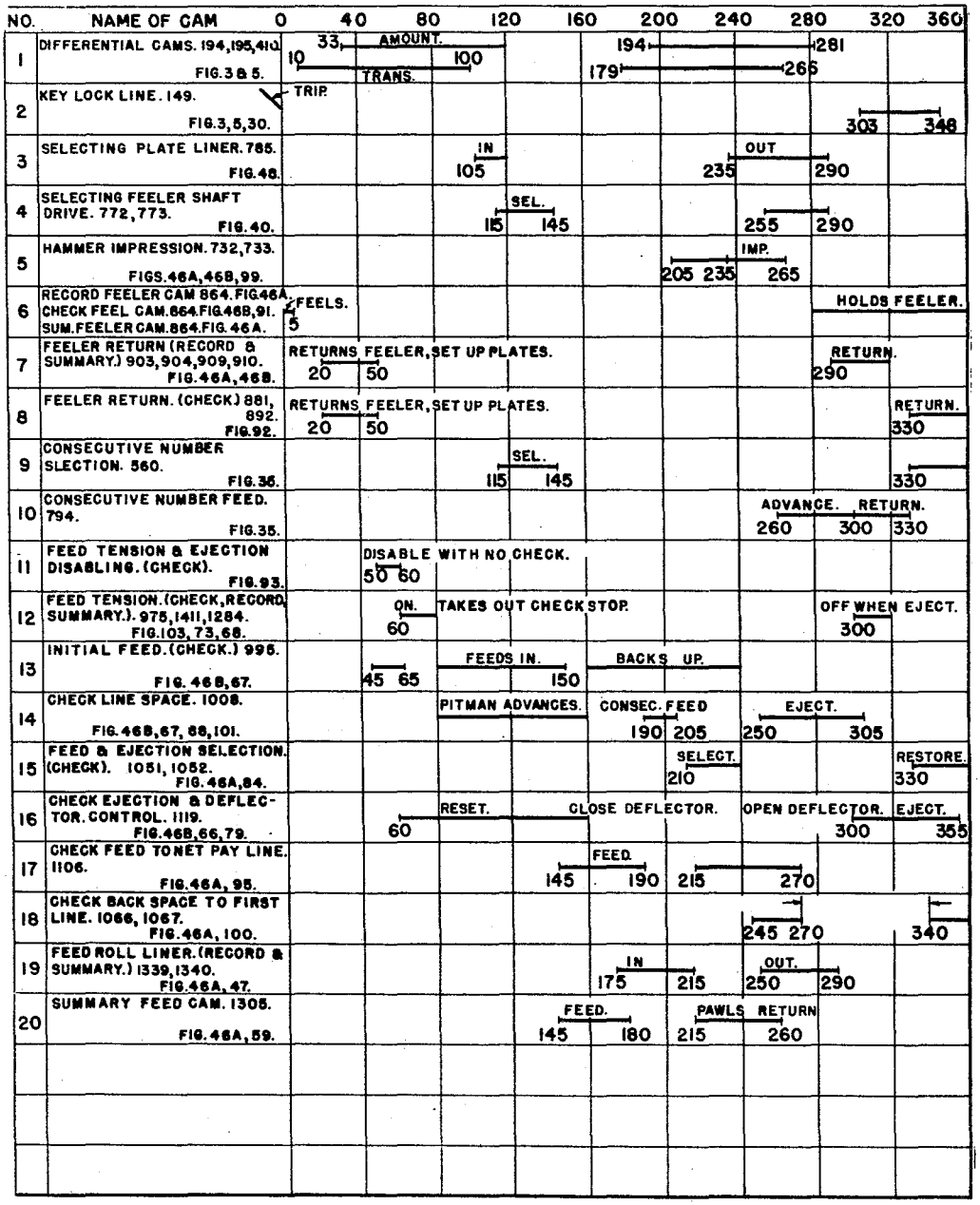

FIG. 109

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Patented Apr. 19, 1949 2,467,704

UNITED STATES PATENT OFFICE

2,467,704

ACCOUNTING MACHINE

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Application December 28, 1943, Serial No. 515,940

30 Claims. (Cl. 101—93)

1

This invention relates to accounting machines and similar business machines, and is directed particularly to the recording means of such types of machines, and the control of the recording means and the control of a plurality of insertable printing mediums to receive printed data thereon.

The invention is embodied in machines of the general type shown in the following United States Letters Patent, and reference may be had to them for a complete showing and description of standard mechanisms not fully disclosed herein: United States Patents Nos. 1,619,796; 1,747,397; 1,761,542; and 1,916,535, issued March 1, 1927; February 18, 1930; June 3, 1930; and July 4, 1933, respectively, to Bernis M. Shipley; No. 2,175,346, issued October 10, 1939, to Maximilian M. Goldberg; No. 2,141,332, issued December 27, 1938, to Charles H. Arnold; No. 1,693,279, issued November 27, 1928, to Walter J. Kreider; and No. 2,305,000, issued December 15, 1942, to Mayo A. Goodbar; and the following co-pending applications for United States Letters Patent for accounting machines: Serial No. 359,374, filed October 2, 1940, by Pascal Spurlino and Konrad Rauch, now United States Letters Patent No. 2,361,662, issued October 31, 1944; Serial No. 381,962, filed March 6, 1941, by Pascal Spurlino, Mayo A. Goodbar, and Marvin D. Frost, now United States Letters Patent No. 2,345,839, issued April 4, 1944; and Serial No. 384,930, filed March 24, 1941, by Everett H. Placke, now United States Letters Patent No. 2,351,541, issued June 13, 1944.

The machine embodying the present invention, and as now constructed, is well adapted for use by any organization where a large number of payroll checks are to be issued periodically, and particularly where such organizations wish to keep accurate records of totals of amounts paid to their employees, and also a record of various deductions which nowadays are common practice. As is well known, such deductions include social security payments, group insurance premiums, payments on advances made to the employees by the company, interest on such payments, bond purchases, income tax withholdings, credit union savings, and many other types of deductions which various organizations permit their employees to make against their gross earnings for a definite period.

Accurate records of each of the various types of individual deductions are accumulated in the machine, with the result that the company may at any time definitely ascertain, by means of printed records, the various totals of such deductions, also the totals of the net earnings of the

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employees, the gross earnings of the employees, and the advances made to the employees.

Other records, such as the total number of regular hours worked and the total number of overtime hours worked, are also accumulated in the machine, so that the company may also at any time definitely ascertain, by means of printed records, the number of regular hours paid for and also the number of overtime hours paid for.

The machine is also adapted to print a payroll check, upon the main portion of which are shown a consecutive number, the date, and the net amount of the check printed in two places. On a stub portion of the check, which is to be torn off and retained by the employee before he cashes the check, are shown the number of regular hours he worked, the gross earnings for those regular hours, the number of overtime hours, the gross earnings for the overtime hours, a total of the gross regular-hour and overtime-hour earnings, a list of all deductions showing the amount of each, a symbol for each deduction, and the net pay. The net amount printed on the stub portion of the check is identical with the net amount which is printed in two places on the main portion of the check.

In some instances, a company may wish to pay off in cash instead of by check, and, when this system is used, the machine is adapted to print upon a pay envelope. This envelope is printed like the check, except that the consecutive number is omitted and the net amount is printed only once on the flap.

The machine is also adapted to print upon a payroll summary sheet. Upon this sheet, at the left-hand side thereof, are written, either by hand or by typewriter, the employee's name, his check number, and his rate. These may be written in one column, and any necessary remarks concerning this particular employee may be entered in another column. In the illustrated form, the machine prints data in the remaining eleven columns. The number of columns may vary for different uses. There are two line spaces allotted to each of the employees' columns set aside for various data. In one column, there is printed a consecutive number; in another column, in the top space for the employee, is printed his gross pay, and in the second space his net pay; in another column are printed the regular number of hours the employee worked and also the number of overtime hours he worked; and in the next column are printed the gross amount of his pay for regular hours and the gross amount of his pay for overtime hours. The next column is al-

lotted to extra money, such as premiums for working at special times, such as the night "trick," Sundays, or holidays, or bonuses which the employees may receive; the next six columns are allotted to deductions, there being two deductions printed in each space, if the employee has that many deductions to be charged against his gross earnings.

A payroll summary may, therefore, be allotted to each department, or, if the departments are too large, it may be allotted to the various jobs of the departments.

An individual employee's earnings record card may also be printed by the machine. Upon this earnings card, which is divided into columns, and each column into two printing spaces, there may be printed, for example, at the left, the number of regular hours the employee works and the number of overtime hours he works; in the next column may be printed the gross amount of earnings for regular hours employed and the gross amount earned for overtime hours employed; the next column is set aside for any extra money which the employee may earn, such as dividends or bonuses; and the next six columns are set aside, wherein all of his deductions each week may be recorded. In the last column, there is a space for a Balance forward, which is picked up from a former earnings record, set up on the keyboard of the machine, and printed in this column when a new card is begun for the employee when his old card is filled. In the right-hand column and in the top line of the two-line space allotted for the first posting is the gross amount of the employee's pay for the particular pay period of the employees, and in the second line is printed the total or gross amount of his earnings; say, for example, from the beginning of the year. This gross amount is the sum of the prior earnings plus the current weekly earnings, which, therefore, becomes the earnings to date.

On top of the machine there is provided a platen, somewhat similar to the ordinary typewriter platen, around which may be placed the basic payroll from which the postings on the earnings card, the payroll summary, the employee's check, or the employee's envelope may be taken. This platen, as will be described later, is adapted to be automatically fed one line space each time the Net pay key is operated, which is normally the last operation when payroll checks or payroll envelopes are made out. The platen may also be turned by hand by the usual knob on the end thereof.

Alongside the platen upon which the basic payroll is carried, there is a device carrying employees' time cards or other types of data-bearing forms from which the operator may obtain the number of regular hours and also the overtime hours worked. On this card, there are also various types of deductions which have been previously mentioned and which are recorded thereon by the clerk.

These time cards are adapted to be ejected from the stack upon the operation of the Net pay key, and there is mechanism connected between the operating means for the ejection of these cards and the platen alongside the device which holds the cards, for turning the platen to feed the basic payroll one step, as above mentioned, whenever the Net pay key is depressed.

In some instances, it may be that certain organizations do not use the time card system, and therefore the time cards and the device for holding them may be eliminated from the machine, the posting operator getting all of her information from the basic payroll sheet which has been put around the platen on top of the machine above the keyboard.

Assuming that all the totalizers in the machine are clear and that the operator is getting ready to run a group of pay checks for a department of a business or any selected group, the operator will first depress the "Net pay" key, with no forms in the check position, so as to set the feeding mechanism of the printing devices in position to feed the forms after they are put in the machine. This operation of the machine under control of the "Net pay" key also clears the crossfooter, thus assuring that the proper gross and net amounts will be printed on the check and other printing mediums adapted to receive such data.

The next operation is to insert the payroll summary and insert the check, after which the operator, from the earnings record card, picks up the prior earnings of the employee—that is, sets up the amount of the employee's prior earnings on the amount keys—and then operates the "Prior earnings" key. During this operation, the machine accumulates the amount of the prior earnings, which has been picked up in a totalizer set aside for that purpose.

In case the operator does not insert the check before recording the prior earnings, the check feeler mechanism controls the check tension rolls so that the check may be inserted during or after the operation of entering the prior earnings in the crossfooter.

The amount keyboard is constructed with a permanent "split," which, as is well known in the art, in machines of this type, provides for just twice as many totalizers as there would be if there were no split in the machine. The keyboard is split so that there are eight rows of amount keys in the right-hand side of the split and seven rows of amount keys on the left-hand side of the split.

The next operation after picking up the prior earnings, in connection with the running of a payroll, is the setting up of the regular hours on the amount keys on the left-hand side of the split, and setting up the amount of money earned on the amount keys on the right-hand side of the split. The operator then depresses the Hours and Amount key "R," and during this machine operation the amount of regular hours and the amount of money earned for those hours are printed upon the payroll summary, upon the check stub, and upon the earnings record card. The number of regular hours are accumulated in a totalizer set aside therefor, and the money earned is added into a totalizer for such amounts. The amount of money also is added into a crossfooter or add and subtract totalizer.

The next operation is to set up the amount of overtime hours and the amount of overtime money earned on the keys to the left and right of the split, respectively, after which the operator operates the Hours and Amount key "T," whereupon the machine prints the overtime hours and the overtime amount on the payroll summary, on the check stub, and also on the earnings record card. The number of overtime hours is added into its allotted totalizer, and the amount of overtime money is added into its allotted totalizer and into the crossfooter.

If there are any other special moneys to be paid to this particular employee whose check is

being written, such as dividends and bonuses, such amounts are set up on the amount keyboard and the Amount key "S" operated for the dividends and the Amount key "X" operated for the bonuses. Such amount or amounts will be printed upon the payroll summary, upon the check stub, and also upon the earnings record card, and added into their respective totalizers and into the crossfooter.

The next operation is to read the crossfooter by depressing the "Gross" key, which prints the gross amount (sum of the regular hours amount, overtime hours amount, and dividends and bonuses, if any) on the payroll summary, on the check stub, and also on the earnings record card.

Since the gross amount of pay which the employee has earned is now recorded and stored in the crossfooter of the machine, the operator proceeds to make a record of the various deductions, whatever they might be, such as income tax withholdings, old age benefits, insurance, etc. For each of these separate deductions, the operator sets up the amount on the keys to the right of the split and then depresses the appropriate one of the keys "A" to "N" set aside for the particular deduction made. During this operation, the deductions are printed upon the payroll summary, upon the stub of the check, and also upon the earnings record card. The amounts of these several deductions are subtracted from the crossfooter to arrive at the employee's net pay.

During these operations, the payroll summary is shifted or fed to print in both lines of the space allotted for each employee, and the earnings record card is likewise shifted. This feed from line to line in one space is positively controlled by the keys of rows 2 and 3. Each key has a definite position in which to print. The payroll summary is also fed from either line in one space to the top line of the next space during the "Net pay" operation, but the earnings record card is not so fed.

During these operations, the check is fed after the printing of the hours and earnings for the regular time worked, and then fed again after the printing of the overtime hours and overtime money, so that the gross earnings is printed below the regular and overtime amounts of money. If there are any special earnings, such as dividends and/or bonuses, the check is fed and these amounts are printed and recorded before the gross amount is printed on the check. Then, upon the registration of the first deduction, the check is fed back so as to print in line opposite the regular hours, and is fed after each deduction is made. The next operation is to make a record of the earnings to date, and to do so the operator depresses the Earnings-to-date key, which prints that amount on the earnings record card in the second line of the space allotted to this particular posting for the particular employee whose card is in the machine.

After this operation, the operator depresses the "Net pay" key, which clears the crossfooter so as to print the net amount of the employee's pay underneath the gross amount of the employee's pay on the payroll summary. During this operation, the check is automatically fed back to the fourth line position, whereupon the net pay is printed on the stub of the check and is also printed twice on the main portion of the check, which the employee cashes. After the check is all printed, it is ejected and inverted, so as to be stacked in proper numerical order.

These operations are repeated for each employee in any selected group which the operator has taken according to the system used in various businesses where the machine is located. In case a pay envelope is used in place of a check, the gross amount of the employee's pay is printed on the envelope, and each of the several deductions is printed on the envelope, the envelope being fed after the printing of each of the deductions. The envelope is then fed back to the fourth line, and upon the operation of the "Net pay" key, the employee's net pay, which is the difference between the gross amount and the sum of the several deductions, is printed on the envelope in line with the fourth deduction.

After a definite group of employees' checks or pay envelopes have been printed and records made in the machine, the operator proceeds to make what is known as a clearing payroll posting. Prior to doing this, the payroll summary is inserted in the machine to the Total line position. After the insertion of the payroll summary into this position, the several totals are taken in the following order: the clearing of the Prior earnings total by the depression of the "Clear row 2" key and the "Prior earnings" key. Next, the Total earnings to date are printed upon the payroll summary by the depression of the "Clear row 4" key in conjunction with the "Prior earnings" key. This clears the group total 4, known as the GT4 totalizer, the "Prior earnings" key acting, at this time, merely as a machine release key.

The operator next clears the Earnings totals by the depression of the "Clear row 4" key in combination with individual operations of the "X," "S," "T," and "R" keys.

The deduction totals are next cleared by the depression of the "Clear row 4" key in combination with the keys "K," "L," "M," and "N" on separate operations, and by the depression of the "Clear row 3" key in combination with the keys "A" to "J" inclusive in separate operations. The operator then ascertains the net total, which is accomplished by the depression of the "Net pay" key in combination with the "Total net pay" key.

For all of the above operations, the analysis control or print control lever at the left of the machine is in the No. 0 position.

The consecutive number is advanced during the "Net pay" operation, so that the consecutive number will be printed upon the payroll summary and also upon the main portion of the check.

The machine is so constructed that, when the operator finishes running the payrolls, the machine may be used for an analysis machine for the distribution of various data, the account and folio number and then the amount of hours and money, for example, for determining the cost of manufacture of groups of articles which are being manufactured, if the machine is used in such a place, or it may be used for analyzing in other mercantile establishments to obtain the costs and selling prices of groups of articles. When analyzing, the analysis control or print lever at the left of the machine is moved into the No. 1 position or into the No. 2 position, depending upon whether or not it is desired to have the consecutive number printed. In the No. 1 position the consecutive number advances, but in the No. 2 position the consecutive number does not advance. Account numbers, cost prices, etc., may be printed on a ticket, along with other data desirable, such data being printed from

whatever is set up on the keyboard of the machine.

When the machine is used as an analysis machine, in place of using the payroll summary, there is a place in the machine for a roll of paper to be inserted, upon which various analysis figures may be printed, as set up on the keyboard, depending upon what type of analysis is to be made.

For the purpose of illustrating one form of the present invention, the machine shown herein is constructed to perform the functions stated above. However, it is not intended to limit the invention to this one form of payroll checks or envelopes, or forms for summaries and earnings record cards, as other forms may be used for fulfilling other types of business systems without in any way departing from the spirit of this invention. This is particularly true in connection with the analysis or audit strip, as it may be called, as various types of analytical records may be printed, depending upon the particular type of business in which the machine is used.

It is, therefore, one object of this invention to provide an accounting machine for distributing items into a plurality of classification totals and also provide the necessary crossfooters or add-subtract totalizers for obtaining the proper totals and balances of the various necessary items.

Another object of this invention is to provide means for changing the machine from a payroll-writing machine to an analysis machine, with the least amount of effort upon the part of the operator, and also to provide a fool-proof machine, as far as the controls of the printing are concerned, when changing from one type of recording to the other type of recording.

Another object is the provision of a consecutive number printing mechanism and novel means to control the actuation thereof under control of the means which changes the machine from a payroll-writing machine to an analysis machine.

Another object is to provide manually adjustable means having a plurality of positions of adjustment, to control the machine to function as a payroll-writing machine when said means is in one of its positions of adjustment and to function as an analysis machine when in any of its other plurality of positions of adjustment, and to control a consecutive numbering mechanism to be effective during the payroll functions of the machine and during analysis functions when said means is in a certain one of its other positions of adjustment, and to be ineffective during analysis functions when said means is in another of its plurality of positions of adjustment.

A more specific object is the provision of a manually operable lever and a manually operable key to change the machine from a payroll machine to an analysis machine when the lever is adjusted to a certain position and said key is depressed.

Another object of this invention is to provide an accounting machine with a more flexible type of record material feeding mechanism.

Another object of this invention is to provide a special and novel feeding mechanism to take care of printing in the proper spaces allotted to each employee on the payroll summary record and also on each employee's earnings record card.

A more specific object is to provide means under control of the keys of the control rows for determining which line of the payroll summary and which line of the earnings record is to receive the printed data for the various operations which are required to record all data in connection with a payroll check which is printed during these operations.

A further object is to provide novel means under control of the control keys for selecting the columns, on the payroll summary and on the earnings record, and the line in the selected column to receive the printed data for each of the several operations necessary to completely record a check-writing transaction.

A further object of this present invention is to provide a novel control for the several impression means associated with the payroll summary and the analysis strips which may be used to be printed upon by certain of the same hammers and printing mechanisms that print upon the payroll summary.

A still further object of this invention is to provide novel means of control for the printing mechanism which is dependent upon the type of operation through which the machine is being put, whether it be analysis or payroll recording.

A further object of this invention is to provide novel control means for the printing mechanism when a clearing payroll posting is being run.

Another object of the present invention is to provide means for easy substitution of the analysis strip for the payroll summary in the machine when the machine is to be used for analytical purposes instead of the writing of payroll checks and the recording thereof on a payroll summary.

A further object is to provide the necessary controls for eliminating the operation of the hammer and printing mechanisms associated with the earnings record card during the running of the analysis of the various types.

Another object of this invention is to provide a hand-spacing or feeding mechanism for the payroll summary in case the operator wishes to feed the payroll summary independently of the automatic feeding.

Another object is the provision of novel means under control of a manually operable lever to release the tension on the earnings card and lock the machine when the proper forms are not in the machine to be printed upon for certain types of operations.

Another object of this invention is the provision of a novel ejecting mechanism for the check and/or for a pay envelope in conjunction with the feeding mechanism for the check and the pay envelope and the control thereof.

A further object is to provide an ejecting mechanism which will eject, with the same effectiveness, any printing medium regardless of its thickness and/or its rigidity.

Still another object is the provision of novel mechanism under control of feeling devices associated with the various printing or recording mediums to control the effectiveness of the feeding devices for such printing or recording mediums.

Another object is the provision of novel mechanism under the control of feeling devices associated with various recording mediums to control the actuation of the means which records on said recording mediums.

Another object is the provision of novel devices under control of the feeling devices to control the releasing mechanism for the machine to

determine when the machine shall or shall not operate.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form or embodiment of which is hereinafter described with reference to the drawings which accompany and form a part of this specification.

In said drawings:

Fig. 1 is a perspective view of the entire machine embodying the invention.

Fig. 2 is a diagrammatic view of the keyboard of the machine.

Fig. 3 is a section of the machine, taken to the right of one of the amount banks, and shows the differential mechanism, the totalizers, and a part of the control mechanism for the printer wheels.

Fig. 4 is a skeleton view of a part of the mechanism for controlling the operation of the differential mechanisms of one transaction bank by certain keys of another transaction bank.

Fig. 5 is a section alongside the second transaction bank, showing the automatic control of the differential mechanism of row 2, a part of the second bank being broken away to show a part of the third transaction bank.

Fig. 6 is a detail of a portion of the transfer total drive mechanism from the machine.

Fig. 7 shows the totalizer controlling mechanism relative to its timing, for adding, reading, resetting, and transfer of total, and the transfer total selection and drive.

Fig. 8 is a detail of the totalizer engaging control for the transfer of totals.

Fig. 9 is a detail view of the totalizer engaging control for add, read, and reset operations.

Fig. 10 is a detail view of a portion of the consecutive number and date lever lock control.

Fig. 11 is a detail view showing the consecutive number and date lever lock.

Fig. 12 is a diagrammatic view of the controlling bars associated with rows 1, 2, 3, and 4, and their control by the keys.

Fig. 13 is a facsimile of a portion of an analysis strip printed by the machine.

Fig. 14 is a detail of the automatic latch control for row 2.

Fig. 15 is a detail view of the mechanism for releasing the time card by the Net pay key.

Fig. 16 is a detail view of the interlock control by the Analysis key.

Fig. 17 is a wiring diagram of the time card operating mechanism.

Fig. 18 shows the zero stop control of row 4 from the Net pay key.

Fig. 19 shows the zero stop of row 4 for the differential mechanism thereof.

Fig. 20 is a facsimile of a portion of another type of analysis strip.

Fig. 21 shows the automatic control of the differential of row 2 latch by the deduction keys of rows 3 and 4.

Fig. 22 is a detail view of the control lever of row 4 for the automatic control of the row 2 latch.

Fig. 23 is a detail view of the automatic control of row 2 latch by the plus key in that row.

Fig. 24 is a facsimile of one form of stub pay check, which may be printed by the machine.

Fig. 25 is a facsimile of a ticket which may be printed by the machine, having thereon analysis figures printed when the operator is performing certain types of analytical operations.

Fig. 26 is a facsimile of one form of pay envelope which may be printed by the machine in place of the check if desirable.

Fig. 27 is a diagrammatic view of the cross-footer or add and subtract shifting cams for the add and subtract totalizer, indicating where the split in the totalizer is.

Fig. 28 is a facsimile of a payroll summary of one type which may be printed by the machine, showing the various data thereon which is printed when making out payrolls.

Fig. 29 is a facsimile of a portion of an earnings record card of an employee.

Fig. 30 shows the printer drive control and the positive stop for the printer cam line under the control of the row 3 printer selection.

Fig. 31 shows a detail of a portion of the row 4 printer selecting mechanism.

Fig. 32 shows the total control plate for the printer selection.

Fig. 33 is a detail view of the interlock between the key lock line (machine release line) and the consecutive number and date lever setting means.

Fig. 34 shows the consecutive number and date setting means and the liner release mechanism for the same.

Fig. 35 shows the consecutive number operating mechanism and the control for the same by the hand lever.

Fig. 36 is a detail view of a date setting lever.

Fig. 37 is a detail view of the consecutive number and date lock operating means.

Fig. 38 is a view showing a portion of the consecutive number and feeding mechanism.

Fig. 39 is a plan view of a part of the payroll summary sheet printing control mechanism.

Fig. 40 is a detail view of the selecting feeler shaft drive.

Fig. 41 is a detail view of the mounting of the consecutive number and date setting unit.

Figs. 42—A and 42—B together constitute a plan view, in reduced scale, of the printer frame and shafts.

Figs. 43—A and 43—B together constitute an elevation of the earnings record card printing mechanism.

Figs. 44—A and 44—B together constitute a plan view of the earnings record card printing mechanism.

Fig. 45 is a fragmentary plan view of the payroll summary printing hammers and table and shows the receptacle for the analysis paper roll and the hinged lid for said receptacle.

Figs. 46—A and 46—B together constitute a plan view of the printer drive cam shaft and the associated cam arm shafts.

Fig. 47 is a detail view of the earnings record card and payroll summary alining mechanism.

Fig. 48 is a detail of the selecting plate aliner mechanism.

Fig. 49 is a detail showing the earnings record card tension control.

Figs. 50 to 54 inclusive show five earnings hammer selecting plates, which taken together in combination select the hammers 4 and 15 for printing the employee's earnings on the payroll summary and the check.

Fig. 55 is the basic payroll or work sheet platen feeding mechanism and the operating means therefor.

Fig. 56 shows a detail of the feeding mechanism for this work sheet platen.

Figs. 57—A and 57—B, taken together, constitute a view showing the relationship of all selecting plates and their associated feeling means, the latter being in diagrammatic relation thereto.

Figs. 58—A and 58—B, taken together, show in diagrammatic form the relationship of all groups of type wheels (indicated by rectangles) and their hammers in front elevation.

Fig. 59 is a full-size view of the payroll summary and earnings record card feed and the summary control from the total row 1, shown in the normal position. (There are two such mechanisms identically the same except for one of the control disks.)

Fig. 60 is a full-size detail view of a portion of the mechanism of Fig. 59, showing the control from row 2 in the moved position.

Fig. 61 is a full-size detail view of the control of the payroll summary and earnings record card feed from row 2.

Fig. 62 is a full-size view of the consecutive number feed control of the payroll summary.

Fig. 63 is a plan view of the mechanism shown in Figs. 59, 60, and 62, except the cam and the cam arm associated therewith.

Figs. 64—A and 64—B together constitute a chart of control or selecting plate groups, where there are four plates in a group, showing how the control notches are cut in each of the plates for the controlling of the various hammers, the control of the machine lock, the control of the payroll summary line selection, the control of the earnings record card line selection, the control of the consecutive number advance, and the control of several of the hammers for printing upon the payroll summary and upon the earnings record card; and also indicates by which control row of control keys they are controlled, and further indicates where they are controlled by the payroll summary feeler, the earnings record card feeler, and also the check feeler, there being special symbols indicated in the foot-note showing where these various feelers control.

Fig. 65 is a chart of the control or selecting plate groups, where there are three plates to the group, showing how these groups of plates are notched out for control purposes, for controlling the spacing of the payroll summary sheet; the feeding, both forward and backward, of the check; the check ejection; the earnings record card release; and several hammers for printing upon the check, the payroll summary, and the earnings record card; and shows which rows of control keys control the various plates and also indicates where these plates are controlled by the payroll summary feeler, the check feeler, and also the earnings record card feeler.

Fig. 66 is a general view illustrating a part of the check ejecting mechanism.

Fig. 67 is a general view of the check feeding mechanism.

Fig. 68 is a general view of the payroll summary sheet control and shows the supply roll for the analysis strip and the receptacle therefor, which strip may be used to be printed upon in place of the payroll summary when the machine is used for analytical purposes instead of when it is being used for the issuing of payroll checks.

Fig. 69 is a detail view showing the hand feed for the payroll summary and also shows the payroll summary tension control feed.

Fig. 70 is a general view of the payroll summary feeding device.

Fig. 71 is a diagrammatic view showing the various steps of feeding both forward and back, and feeding to special positions of the check which is printed during payroll runs.

Fig. 72 shows the analysis control mechanism; that is, the mechanism which assists in converting the machine from a payroll machine to an analysis machine.

Fig. 73 is a detail view of the train of mechanism for controlling the earnings record card tension device.

Fig. 74 is a detail view of the position stop for the earnings record card.

Fig. 75 is a front view of the earnings record card table and a portion of its associated mechanism for moving the same.

Fig. 76 is a detail view showing the earnings record card position stop removing means.

Fig. 77 is a detail view, partly broken away, showing the alining bar for the earnings record card table.

Fig. 78 is a plan view of the mechanism of Fig. 74, showing the position stop for the earnings record card.

Fig. 79 shows the check or envelope ejecting mechanism.

Fig. 80 is a detail view of the check deflector.

Fig. 81 is a detail view of a portion of the check ejecting mechanism.

Fig. 82 is a detail view of the check ejecting mechanism in the moved position.

Fig. 83 is a view of the check feeding mechanism, showing the initial feed and a part of the line-spacing mechanism in the position which this mechanism assumes at the end of the printing of the hours and the earnings for the hours.

Fig. 84 shows a part of the check ejecting mechanism control and a part of the check feed selector mechanism.

Fig. 85 shows a part of the check ejection control mechanism.

Fig. 86 is a view showing the check feeding mechanism—that is, the initial feed—in its normal position.

Fig. 87 is a view of the check feeding mechanism for the initial feed, showing the position of the mechanism at the end of that feed; that is, where the check has been fully drawn into the machine.

Fig. 88 is a detail view of the check feeding mechanism, showing the line-spacing portion of the check feed for feeding the check after the printing of the hours and the amount of earnings for regular hours and also overtime hours.

Fig. 89 is a detail view of the check feeding mechanism, showing that part of the mechanism which feeds the check back to line 1 printing position; that is, in the position for receiving the printing of the first deduction.

Fig. 90 shows the feeler mechanism for the check or envelope, for the payroll summary, and also for the earnings record card. (There are three such mechanisms in the machine, and they are all identically the same.)

Fig. 91 is a detail view of a part of the check feeler mechanism in its normal position.

Fig. 92 is a detail view of a part of the check feeler mechanism in the moved position.

Fig. 93 shows the clutch drive for the check feeler cams and the check ejector cams.

Fig. 94 is an edge view showing the check feed cams, the check ejector cams, and also the cam which controls the tension rolls for the check.

Fig. 95 shows the check feeding mechanism and that part which controls the feed thereof to the fourth line or Net amount position after having printed the various deductions so that the check will always come back to this particular fourth line to have the net amount printed on the stub and also printed twice on the main body of the check and always in the same line.

Fig. 96 is a detail view of a part of the check feeding mechanism shown in Fig. 95.

Fig. 97 is a detail view of a part of the mechanism, showing the hand machine lock releasing mechanism when no check, payroll summary, or earnings record card is present in the machine; that is, when any one of the recording mediums is absent, the machine will not be released during payroll run operations.

Fig. 98 is a detail of the control of the feeler for the machine locking line under control of the feeler mechanism.

Fig. 99 is a detail view of the hammer operating mechanism. (There are three such mechanisms as this in the machine, all identically the same.)

Fig. 100 is a detail view of the check back-space mechanism to the first line of printing to receive the print for the first deduction after the gross amount of the employee's pay has been printed.

Fig. 101 is a detail view of a part of the check line-spacing mechanism shown in Fig. 88 in its moved position.

Fig. 102 is a perspective view showing the control for the check feeding mechanism.

Fig. 103 is a detail view showing the check stop and the check tension mechanism in the position which it assumes after the first printing has been made on the check.

Fig. 104 is a front view of the check ejecting mechanism.

Fig. 105 is a diagrammatic view of the source of control of the groups of control disks in Figs. 50 to 54 and shown on the charts in Figs. 64—A, 64—B, and 65.

Fig. 106 is a view showing the time card box, a portion of which is broken away to show the time cards and the mechanism for operating the time card ejecting means.

Fig. 107 is a modified form of hand control of the check feeding mechanism.

Fig. 108 is a detail view of a portion of the mechanism of Fig. 107.

Fig. 109 is a time chart showing when the various groups of mechanisms in the machine operate.

General Description

Described in general terms, the machine embodying the present invention is of the type generally disclosed in the above-mentioned Shipley and Goldberg patents. These patents disclose a plurality of totalizers into which may be distributed various amounts, according to the business system for which the machine is built.

In the present instance, the totalizers are adapted to receive the many and various items constituting individual transactions that are handled in the process of making out payroll checks or payroll envelopes.

The above-mentioned patents also disclose what are known in the art as add and subtract totalizers or "crossfooters," by which they have come to be known, from which balances may be printed at any desired time.

To control the printing on the various printing mediums, the machine has four rows of control keys and fifteen banks of amount keys, as shown in Fig. 1 and diagrammatically in Fig. 2. The amount keyboard is what is known in the art as a split keyboard. The first seven rows of amount keys on the left control amounts to be added into the left-hand side of a split totalizer, and the eight banks of keys to the right of this indicated split control amounts to be added into the right-hand side of the split totalizer.

The earnings record card is printed at the right-hand side of the machine from ten hammers, the check is printed near the center of the machine from eight hammers, and the payroll summary is printed at the left of the machine from eleven hammers. When the machine is used for analytical purposes and the analyzing strip is placed in the receptacle in the left of the machine where the payroll summary is ordinarily printed, then the first four hammers of the group of eleven hammers are used to print analysis data on the analyzing roll strip.

The earnings card record at the right of the machine is adapted to be fed or line-spaced by novelly constructed feeding mechanism under control of feeling devices and the control keys of the keyboard.

The check or envelope is adapted to be line-spaced and given forward and backward feed movements by novelly constructed feeding mechanism under control of the control keys on the keyboard and also a so-called slip feeler device.

The payroll summary is adapted to be fed by a novelly constructed feeding mechanism under control of feelers and the control keys of the keyboard.

The four rows of control keys at the right side of the keyboard control the selecting of the columns and the selection of the various line spaces in those columns to receive the printed data during the several operations of the machine necessary to complete a payroll check writing and issuing transaction. The number of operations necessary varies with the number of types of earnings to be credited to each employee and also varies with the number of deductions chargeable against the gross earnings of each employee.

The check ejecting mechanism is also controlled by certain of these keys, since it is necessary to actuate said ejecting mechanism at variable times. That is to say, the ejecting mechanism may be actuated after anywhere from one to an indefinite number of operations during the process of writing a payroll check, here again depending upon the number of types of earnings and upon the number of deductions for each employee.

There is also a novelly constructed control device for changing the machine from a payroll machine to an analysis machine with a minimum amount of effort and thought by the operator of the machine. This means comprises, generally, a hand-operated or hand-manipulated lever at the left of the machine, which has three positions, and an analysis key on the keyboard. One position of the lever is an analysis position; that is, a position whereby it has assisted in converting the machine from a payroll machine into an analysis machine. In such position, the machine can be used for analysis distribution of data, and the consecutive number mechanism will be disabled. In another analyzing position of this manipulative lever, the machine can be used for analysis distribution of data, and the consecutive number mechanism will be operated. In the third position of this manipulative lever, the machine can be used for a payroll and dividend machine.

When the machine has been converted from a payroll machine into an analysis machine, the hammers and feeding mechanism for the earnings record card may be disabled, and the mechanism for feeding and ejecting the check and also for printing upon the check may be disabled part of the time, but another part of the time

during analysis, these mechanisms which feed, eject, and print upon the check are used for feeding, ejecting, and printing upon a ticket having analysis data printed thereon under control of keys on the keyboard. Also, during the analysis, the payroll summary, as mentioned above, is not used, and the analysis made is used in place thereof, and consequently a portion of the hammers which normally print in certain columns of the payroll summary are disabled, whereas other hammers which print upon the payroll summary are used to print upon the analysis strip. These controls are all effected under the control of the above-mentioned manipulative lever at the left end of the machine in combination with an Analysis key on the keyboard.

As above mentioned, there is also provided in the machine of the present invention the internal gear driving mechanism, such as that disclosed in the above-mentioned Kreider patent, which is for the purpose of simultaneously setting on groups of devices amounts and data under control of the keys so that printing can be readily accomplished on the payroll summary at the left of the machine, on the check at the central part of the machine, and upon the earnings record card at the extreme right of the machine; that is, when the machine is being used for payroll purposes.

This same internal gear driving mechanism is also used for controlling and setting up the various control plates for controlling other mechanisms, such as feeding mechanism, ejecting mechanism, and slip feeler devices, in addition to the hammers.

As has been pointed out earlier, the amounts which are printed on these various printing mediums, such as the payroll summary, the check, and the earnings record, are set up under control of the keys on the amount keyboard, which in the present instance has the dual function of being used for an analysis and payroll machine. While the machine is being used for payroll purposes, certain groups of keys are used for setting up prior earnings and the regular earnings, and at other times for deductions. These amounts are set up on the right-hand side of the split of the keyboard, and the number of hours, both regular and overtime hours, are set up on the keys at the left-hand side of the split on the keyboard.

When the machine is used for analysis distribution, then the keys, both to the right and to the left of the split, are used for setting up various data numbers and amounts.

The totalizers used in connection with the machine are the same substantially as those disclosed in the above-mentioned Shipley and Goldberg patents.

As has been previously mentioned, the machine keyboard is arranged for taking care of business systems in connection with organizations who wish to issue payroll checks and keep very complete records of all the various transactions which pertain to the issuance of any particular payroll check. The machine is, therefore, provided with the amount keys, as above mentioned, of sufficient capacity to take care of such types of business.

There are also three rows of what are known in the art as "Control" keys, for the purpose of selecting various totalizers for the distribution of the transactions entered in the machine. There is also a row of total-taking keys, which control the machine for the purpose of taking totals of the necessary items in connection with the printing of the payroll checks and for clearing the various totalizers at the close of any day when it is desired to clear out the machine to render it ready for business for the following day or for any other following period.

The total-taking row of keys is designated in the diagrammatic view in Fig. 2 as row 1; the right-hand control row of keys is designated as row 2; the middle row of control keys is designated as row 3; and the left-hand row of control keys is designated as row 4. These designations—that is, row 1 to row 4—will be hereinafter used in connection with these keys when describing in detail the various feed and ejecting mechanisms and slip mechanisms and hammer mechanisms which they control.

Detailed Description

Framework

The accounting machine herein disclosed is divided into two main sections; namely, a machine section and a printer section. The machine section is mounted above the printer section.

The mechanisms of the machine section are supported in a framework mounted on a base, which in turn is supported on a framework which supports the printer mechanism of the printing section, which framework is carried by a heavy base.

The relation of the side frame bases and special frames, and also the tie rods for the machine framework and the printer framework, are generally shown in Figs. 42—A and 42—B. The machine side frames and base, and also the main front tie bar, are also shown in Figs. 3, 5, and 30, and the printer frames are also shown in Figs. 42—A, 42—B, 46—A, 46—B, 57—A, 57—B, 58—A, and 58—B and several other figures to be hereinafter mentioned in connection with specific mechanism which is supported by these frames.

The machine framework will be first described with particular reference to the figures above mentioned, showing the machine framework. This machine framework comprises a left side frame 121 and a right side frame 122 mounted on a machine base 123. An auxiliary frame 124 is secured to the side frame 122 by means not shown, and is also supported by the base 123. A tie bar 125 connects the side frames 121 and 122 across the front, and a back frame 126 ties the frames 121 and 122 together across the back. These frames 121 and 122 support the main body of the machine section of the accounting machine.

The printer section of the machine is all mounted between the side frames 131, 132, 133, 134, 135, and 136, supported by a printer base 137. Frames 131 and 136 are secured to the ends of a tie bar 138, which properly spaces these frames apart. The side frames 132, 133, 134, and 135 are cut away, as shown in Figs. 66, 68, and 79, and each is attached to the tie bar 138 to insure that they are always held in their proper lateral positions.

A tie bar 139 is spaced between the frames 131 and 136 at the rear ends thereof, to maintain the proper distance between these two frames at their rear ends. The frames 132, 133, 134, and 135 are cut away, as shown in Fig. 43—B, so that they may be attached to this tie bar 139 so that their rear ends may be held in proper lateral positions.

Auxiliary frames 140 and 141 (Figs. 42—A and 42—B) are arranged between the frames 132 and

132, and 133 and 134, respectively, and are secured to the tie bars 138 and 139. Another auxiliary frame 142 to the right of the frame 136 is secured to the base 137.

Near their front ends, the frames 131 and 133 are again tied together by a tie bar 143, which is also secured to the extreme front end of the frame 132. A tie bar 144 is secured between the front ends of the frames 133 and 134 to hold their front ends in proper position, and a tie bar 145 is secured to the frames 134, 135, and 136 to hold the front ends of these frames in proper lateral positions.

The machine section of the accounting machine and also the printing section thereof are enclosed in a suitable cabinet 146 (Fig. 1) having the necessary hinged sections for access to certain parts of the machine by the operator whenever necessary. Certain of these sections will be described later in connection with specific mechanisms with which they are directly associated. All of the hinged sections, wherever necessary, are provided with suitable locks to prevent unauthorized persons from having access to the inner parts of the machine.

Operating mechanism

Normally the machine is electrically operated by a conventional type of motor such as that disclosed in the Shipley patents referred to hereinbefore, and, in addition, a hand crank (not shown) is provided for operating the machine manually whenever necessary. The well-known electric starting bar used on previous machines has been omitted from this machine, and, instead, the machine is released for operation by depression of any one of a plurality of so-called "motorized" or "operating" keys located in the control rows of keys; that is, rows 1, 2, 3, and 4 (Fig. 2). These keys will be explained more in detail later in the specification.

Depression of any of the operating keys releases a key lock shaft 149 (Figs. 3, 5, and 30) to the action of a spring (not shown) which rocks said shaft a slight distance clockwise to operate the clutch mechanism which connects the driving motor to a main shaft 150 journaled in the machine side frames 121 and 122. The movement of this key lock shaft 149 simultaneously operates the switch mechanism which closes the circuit to the motor, thus causing the motor to operate and drive the main drive shaft 150.

The machine herein is adapted to make two types of operations, one of which is an adding operation, consisting of one cycle, and the other of which is a total-taking operation, consisting of two cycles. In this application, one complete rotation of the main drive shaft 150 is considered "one cycle" of operation.

As has been stated above, the machine is adapted to be used for making out the payroll, which involves the issuing of checks having printed thereon various data, such as the employee's gross earnings and his deductions and net earnings, in addition to several other types of data which the machine is adapted to print.

The setting up and registering of the gross pay, deductions, number of hours, etc., are one-cycle operations. The printing of the employee's net pay is a two-cycle or total-taking operation wherein the net pay is printed as the balance remaining after the various deductions have been made from the employee's gross pay.

Therefore, it can be seen that, in order to issue pay checks for one employee, it requires several operations of the "one-cycle" type and also several operations of the total-taking type, which consists of two cycles.

Near the end of each single-cycle operation and near the end of the second cycle of two-cycle operations, the key lock shaft 149 is returned counter-clockwise to disengage the clutch mechanism and simultaneously open the motor switch to the electric motor, thus causing the machine to stop when it reaches its home position.

The timing for this key lock shaft 149 is shown in line 2 of the time chart in Fig. 109 and shows that, before the cam shaft 150 begins to operate, the tripping of the key lock shaft 149 takes place, and that, near the end of the cycle, the key lock shaft 149 is moved to its normal position, as has just been described.

When the machine is manually operated by the use of a hand crank, the operating keys are used for releasing the machine in exactly the same manner as when the machine is electrically operated.

Printed records

As has been previously stated, the machine herein, when making payroll runs, is adapted to print upon three printing mediums, and it is felt that it would be a good idea to describe them at this time, as they will be referred to all throughout the specification, and particularly in connection with the description of the keyboard and the printing mechanism.

For illustrative purposes, the machine herein is adapted to print in 29 different columns on three different printing mediums during the operations involved in issuing pay checks to employees.

It is to be clearly understood that this number of columns, 29, is for illustrative purposes only, and that it may be increased or decreased, depending upon the type of records which are desirable for any particular type of payroll posting which the customer desires.

As shown herein, each of these columns is numbered from 1 to 29, so that they can be quickly and easily identified in connection with data and particularly in connection with the keyboard controls to be described hereinafter.

At the left of the machine, a payroll summary 151 (Figs. 1 and 28) is printed. Near the center of the machine, a pay check 152 (Figs. 1 and 24) is printed, and, at the right of the machine, an earnings record 153 (Figs. 1 and 29) is printed.

In the illustrated form, the payroll summary (Fig. 28) has three columns at the left, headed "Employee's name," "Rate," and "Remarks." In these three columns, data may be written either by hand or by typewriter, relative to the employee whose name is in the space. This payroll summary may be of a length desired by the company issuing the payroll to cover certain size departments or any certain number of payroll checks, such as fifty. If it is for fifty, then there are fifty spaces for the names of fifty employees. To the right of these three columns are eleven columns, in which printed data by the machine may be made. These columns are numbered 1 to 11. In column 1, headed "Number," is printed the consecutive number. In column 2, headed "Gross pay" and "Net pay," the machine prints the gross pay and the net pay of the employee, the gross pay always being printed in the top line or section of the space allotted to the employee—for example, as shown, "John Doe"—and in the second line or space is the net pay. In column 3,

headed Key "R" and Key "T," there is printed a symbol designating the key "R" and the number of regular hours the employee worked, and a symbol "T," designating overtime hours. Column 4 is headed Key "R" and Key "T," and in this column are printed the symbol "R" and the amount of money earned for regular hours working, and a symbol "T" and the amount of money earned for overtime hours worked. Column 5 is headed Key "S" and Key "X." These keys are set aside for the registration of additional money earned by the employee, such as premiums or bonuses, and key "S" may be for premiums, and in that event this amount will be printed in the top line of the space and the bonuses will be printed in the bottom line. The next six columns, numbered 6 to 11, are set aside for deductions which may be made from the employee's gross pay, each column and the top and bottom spaces in each column being definitely controlled by the keys whose symbols are indicated at the top of each of the respective columns. The amounts, of course, in the various columns are set up on the amount keys of the keyboard, to be described later.

On the check 152, shown in Fig. 24, columns 12 to 19 have been indicated. In column 12 is printed the number of regular and overtime hours. In column 13 is printed the amount of earnings of the employee; namely, the amount of regular earnings and overtime hour earnings and the gross amount. In column 14 are shown symbols and several amounts representing various deductions which are chargeable against the employee's gross pay. In column 15 is printed the net pay. In column 16, which is the first column on the main portion of the check, is printed the consecutive number; in column 17 is printed the date; in column 18 is printed the net pay; and in column 19 the net pay is printed.

The earnings record 153 (Fig. 29) is set aside for individual employees; in other words, a complete record of his earnings for a period of 13 weeks, for example, is shown on his earnings record. In the left-hand column are the line numbers 1 to 13 in the illustrated form. The columns on this earnings record have been numbered 20 to 29. In the columns 20 to 28 there is printed data identical with that printed in columns 2 to 10 of the payroll summary 151. In column 29, which is headed "Gross pay" and "Earnings to date," there is one line opposite the heading marked "BF," which is Balance forward, which is picked up from an earnings record which has the full 13 lines completed; in other words, this might be the second period of 13 weeks for this particular employee, and, therefore, his earnings to date would be picked up from the previous earnings record card and inserted in this column by hand.

In the top section of line 1 is printed the employee's gross pay, and in the bottom section of line 1 is printed the sum of his prior earnings plus his gross pay, which amounts to his earnings to date. The printing of this earnings-to-date is a total-taking operation which will be described hereinafter. In case the company wishes to issue pay envelopes and pay in cash instead of paying by check, a pay enevelope 154 (Fig. 26) may be printed in place of the check 152. On this envelope, which has indicated thereon columns 12 to 18, is printed data similar to the data that is printed on the check; in fact, it is identical except that there is nothing printed in column 16 and there is nothing printed in column 19.

As has been previously stated, when the machine is converted from a payroll run machine or payroll writing machine into an analysis machine, the earnings record 153 is not printed upon, nor is the check 152 or the pay envelope 154 printed upon, nor is the payroll summary 151 printed upon. In place of the payroll summary 151, an analysis strip 155 (Figs. 13 and 20) may be printed upon to record the distribution of various analytical data which is being distributed in the machine. This data is printed in positions corresponding to columns 1 to 4 of the payroll summary, and therefore these columns have been so indicated on the analysis strips.

At the end of the type one analysis, the operator takes a total of several amounts and data which have been distributed, and this total is printed on the analysis strip 155, and it may also be printed on a ticket 156 (Fig. 25), which has indicated thereon columns 12 to 17. As noted in Figs. 13 and 20, there is nothing printed in column 2 on the analysis strip 155, and on the ticket 156 (Fig. 25) there is nothing printed in columns 14 and 15; however, the amount printed in column 12 is the same as the amount printed in column 3 of the analysis strip, the amount in column 13 is the same as that printed in column 4 of the analysis strip, and the number in column 1 on the analysis strip is printed in column 16 on the ticket. The date, which is printed in column 17 on the ticket, is not printed on the analysis strip.

The mechanisms for feeding the payroll summary, the earnings record card, the check, the envelope, and the analysis strip will be hereinafter described in detail in connection with the printing section of the machine, and the means for printing the data upon these record mediums will also be later described in detail.

Keyboard

The keyboard of the machine is shown in diagrammatic form in Fig. 2 and is also indicated in the perspective view of the machine shown in Fig. 1.

Referring now particularly to the diagrammatic view of the keyboard as shown in Fig. 2, there are seven rows or banks of amount keys 160 to the left of a permanent "split," indicated by a dotted line, and to the right of this split there are eight rows or banks of amount keys 161. This gives a registering and accumulating capacity of seven banks to the left of the split and eight banks to the right of the split for the totalizers in the machine, which are split according to the permanent split between the keys 160 and 161 in a manner well known in the art.

To the right of the amount keys 160 and 161 there are four rows of control keys designated "Row 1," "Row 2," "Row 3," and "Row 4." The first three keys 162 of row 1 are operating keys; that is, they release the machine for actuation when depressed and are used only when the machine is being used for writing payroll checks. The top three keys 163 of row 1 are non-operating keys and are used to select the totalizers corresponding to the keys of rows 2, 3 and 4 during clearing operations. The "Net pay" key 162 causes the clearing of the crossfooter and transfers the amount cleared therefrom into a totalizer associated with the "Total net pay" key in row 4. This "Net pay" key 162 also selects line 2 in the printing space of column 2 of the payroll summary and selects line 4 of column 15 on the check to cause the net pay to be printed

in line 2 of column 2 of the payroll summary 151 and in line 4 of columns 15, 18, and 19 on the check 152 (Fig. 24). It also causes the check ejecting mechanism to be released and the consecutive number to be advanced, and causes the consecutive number to be printed in column 1 on the payroll summary 151 and in column 16, line 1, on the check 152.

The "Earnings to date" key 162 clears the earnings to date group total 3 and causes it to be transferred into group total 4. It selects line 2 in column 29 of the earnings record 153 and causes release of the earnings record card after this printing has taken place. The "Gross" key 162 causes a reading operation of the crossfooter to be made and selects line 1 of column 2 of the payroll summary 151, causing the gross pay to be printed in this line, and selects line 1 of column 29 of the earnings record 153 to cause the gross pay to be printed in this position. It also selects the proper line of the check in column 13 to have the gross pay printed in this line, and, after this operation, the check is caused to feed backward to the first line to receive the first deduction.

The "Clear row 2" key 163 is used to select the totalizer corresponding to the positions of the keys in row 2 when clearing the same. The "Clear row 3" key is used to select the totalizers corresponding to the positions of the keys in rows 3 to clear the same, and the "Clear row 4" key 162 is used likewise in connection with the totalizers corresponding to the positions of the several keys in row 4.

These keys 163 are used during analysis operations for other functions, which will be described in detail in connection with the description of the machine as an analysis machine.

The keys of row 2 are designated 164 the keys of row 3 are designated 165, and the keys of row 4 are designated 166. The three lower keys in row 2 are locked out during all payroll-writing operations, as is the "Analysis" key in row 2. However, when this Analysis key in row 2 is depressed, and it is a non-operating key, it releases the three lower keys in row 2 for depression, and these keys then become operating keys; however, they are not used during the writing of payrolls but are used during the analysis operations of the machine only.

The "Release" key 164 is used to release the "Analysis" key when it is depressed, and the position opposite the "Release" key is used as an automatic position for the keys A to J 165 in row 3 and the N to K keys 166 in row 4. The plus and minus keys 164 are used for making corrections; that is, the minus key is used to subtract an amount which has been erroneously added into the crossfooter, and the plus key is used to add an amount which has been erroneously subtracted from the crossfooter. The "Prior earnings" key is an operating key and is used when setting up the employee's prior earnings.

All of the keys A to J 165 of row 3 are set aside for various types of deductions, which have been mentioned previously, such as insurance, income tax, withholdings, social security, bond deduction, interest, and any number of other types of deductions which the company may allow against an employee's gross earnings. The keys N to K 166 of row 4 are also used for deductions. The key "R" is used to release the machine when the employee's regular amount of hours and the regular amount of his pay are set up on the keys 160 and 161, respectively. The key 166 "T" is used when the employee's overtime hours and overtime amount are set up on the keys 160 and 161, respectively. The key "S" is used when adding into the crossfooter special earnings made by the employee, such as premiums, and the key "X—166" may be used to release the machine when other special earnings, such as bonuses, are to be added into the crossfooter to make up the employee's gross pay.

In connection with the amount keys 160 to the left of the split, when the machine is used as a payroll writing machine, the number of regular hours and overtime hours are set up on the four right-hand banks of keys 160, the three left-hand banks being used for overflow banks. When the machine is used as an analysis machine, then the five left-hand rows of keys 160 are usually used to set up data, there being a "split and normal" between the fifth and sixth banks of keys 160; that is, it is not a permanent split, and, unless their figures run in higher denominations than five digits, they usually use the five left-hand banks of keys 160. The same is true in connection with the six left-hand banks of keys 161, when the machine is being used as an analysis distributing machine. However, when the machine is used in setting up payroll and writing payroll checks, the prior earnings of the employee and his regular and overtime earnings, also special earnings and deductions, are set up by the first six right-hand banks of keys 161. The other three banks of keys 161 to the left are used for accumulating only.

The totalizers and their various arrangements, including the crossfooters, will be discussed later under the heading "Totalizers." However, it might be well to state here that the manner in which the control rows of keys 162 to 166 inclusive control the selection of the different totalizers and the manner in which these keys control the engaging and disengaging movement of the different totalizer lines are fully explained in the Shipley patents previously referred to, and also in the Goodbar patent. Therefore, in view of the above patents, only a general description will be given of the totalizers under that heading, as it is believed that the complete illustrations and detailed descriptions of the totalizers in the above-mentioned patents will be sufficient for all purposes herein.

A description of the control keys of rows 2, 3, and 4, and the total row of keys 162 and 163, in connection with their general functions, will now be given in a general way; that is, the manner of setting up the various operations through which the machine must be put in order to complete the writing of a payroll check and the complete registration of all the data necessary to be printed upon the payroll summary and the earnings records in connection with the writing of this payroll check.

First, the employee's prior earnings are set up on the keys 161 and the Prior earnings key 164 is depressed. This amount goes into the prior earnings totalizer "G. T. 2" in row 2, and it also goes into the "G. T. 3" totalizer in the zero position in row 3. Just prior to the operation of the picking up of the prior earnings, the operator inserts the payroll summary 151 into position in the machine, and also the earnings record card 153, which goes at the right-hand side of the machine.

The operator next sets up the number of regular hours worked on the "Hours" keys 160 and the amount of earnings for those hours on the earnings keys 161, and then depresses the "R"

key 166 in row 4. These hours and amounts are added into the hours and amount totalizers on each side of the split in the position corresponding to the "R" key. These amounts of hours and earnings for the regular hours are also added into the "G. T. 3" totalizer on each side of the split of this totalizer, the number of hours going on the left side of the split total and the amount of earnings on the right-hand side of the split total. The operator next sets up the amount of overtime hours on the keys 160 and the amount of overtime earnings on the key 161 and then depresses the "T" key 166 of row 4. These overtime hours and amount are added into both sides of the split totalizer associated with the "T" key and also are accumulated into the "G. T. 3" totalizer. This "G. T. 3" totalizer on the right side of the split now becomes the earnings to date, because it has an accumulation of the prior earnings plus the amount of regular earnings and amount of overtime earnings.

If there are any other earnings, such as premiums, these amounts are set up on the earnings keys 161 and the "S" key is depressed, thus causing that amount to go into the "S" totalizer and also into the "G. T. 3" totalizer. For any such amounts as bonuses, the amount thereof is set up on the keys 161 and the "X" key is depressed, whereupon the amount of bonuses is added into the "X" totalizer and also into the "G. T. 3" totalizer.

It might be well to state here that the totalizer on the upper line to the left of the split is a straight adding totalizer and those on the upper line to the right of the split constitute a crossfooter or add and subtract totalizer and also the "G. T. 2" totalizer. All of the earnings of regular hours and the earnings for overtime hours, and also any special earnings, such as premiums and bonuses, are accumulated into the plus side of the crossfooter, and, as above stated, prior earnings go into the "G. T. 2" totalizer on the right-hand side of the split. This split is indicated in Fig. 27, where are shown in diagrammatic form the totalizers on both sides of the split and the selecting cam for these totalizers.

After the earnings have been all accumulated into the plus side of the crossfooter, the operator then depresses the "Gross" key 162 in row 1 to read the plus side of the crossfooter and print the gross pay in column 2 on the payroll summary 151, in column 13 of the check 152, and in column 29 on the earnings record 153.

The operator then proceeds to set up the various amounts of the several deductions, which may be chargeable against the employee's pay, and, as indicated on the check 152 in Fig. 24, there are six deductions listed after the symbols A to E and J. Each of these deductions requires a separate operation in which the amount of the deduction is set up on the keys 161 and subtracted from the crossfooter. Each of these deductions also is accumulated into totalizers associated with their respective keys.

After listing all of the several deductions, the operator then depresses the "Earnings to date" key 162 in row 1, which clears the "G. T. 3" totalizer and transfers this amount into the "G. T. 4" totalizer, and this amount, Earnings to date, is printed in column 29 of the earnings record 153 (Fig. 29). The next operation is the depression of the "Net pay" key 162 in row 1, which clears the crossfooter, which at this time has in it the employee's net pay, and transfers that net pay to a totalizer associated with the "Total net pay" key 166 in row 4. This amount of net pay is printed in the second line of the space in column 2 on the payroll summary 151 in the fourth line of column 15 on the check and also is printed in columns 18 and 19 on the check.

The above constitutes a complete transaction required in the writing of a payroll check, and, after the depression of the "Net pay" key 162, which, as above stated, clears the crossfooter, the machine is ready for the operator to pick up the prior earnings of the next employee, for the purpose of registering all of the data in connection with his pay, to print a pay check for the amount which he has coming to him.

A consecutive number is printed in column 16 on the check, and the date is printed in column 17 of the check, which date is set up by mechanism to be described hereinafter. The consecutive number mechanism will also be described hereinafter.

Amount banks and their associated differential mechanisms

As previously described, the machine of this invention has seven amount banks of keys 160 to the left of this split and eight banks of amount keys 161 to the right of the split, which may be used in some instances to set up amounts and in other instances to set up hours and various other types of data which are to be used when the machine is being used as an analysis machine.

However, as all of the rows or banks of keys 160 and 161 and their associated differential mechanisms are similar in every respect, it is believed that a description of one of these rows of keys and its differential mechanism will be sufficient.

Fig. 3 is a transverse sectional view of the machine taken just to the right of one of the amount banks, showing said bank and its associated differential mechanism, which will be considered as representative of all of the amount banks. The key bank as chosen will be one of those under the "Earnings" (Fig. 2) amount keys 161. The amount keys 160, it will be understood, are mounted identically the same as the keys 161, and the differential mechanisms therefor are the same.

The amount keys 161 (Fig. 3) are mounted in a key frame 170 supported by rods 171 and 172 extending between and supported by the main frames 121 and 122 of the machine section of the accounting machine. Depression of one of the keys 161 rocks a zero stop pawl 173 for this particular denomination counter-clockwise out of the path of a reset spider 174 free on a hub of an amount differential actuator 175 rotatably supported by a hub 176 extending between two similar amount differential support plates 177 (only one shown here) in turn supported by rods 178 and 179 extending between and supported by the machine side frames 121 and 122. There is a pair of support plates 177 for each amount differential, and a tie rod 180 extends through the holes in the center of the hubs 176 to secure all of the amount differentials in a compact unit.

A slot in the forward end of the reset spider 174 engages a stud 181 in a latch disengaging arm 182 pivoted on an extension on the actuator 175. The arm 182 and a companion arm 183 support a differential latch 184 for horizontal shifting movement. A spring 185 urges the arms 182 and 183 and the latch 184 rearwardly to normally hold a foot 186 of said latch in engagement with a shoulder 187 on a differential driving segment

188 rotatably supported on the hub of the differential actuator 175. A link 189 pivotally connects the driving segment 188 to a cam lever 190 pivoted on a stud 191 in the left-hand one of the plates 177, and said lever 190 carries rollers 192 and 193, which cooperate, respectively, with the peripheries of companion plate cams 194 and 195 secured to the main drive shaft 150. Depression of one of the amount keys 161 moves the lower end thereof into the path of a rounded surface 196 on an extension of the arm 182.

In adding operations, which, as explained earlier in this specification, consist of one cycle or one rotation of the cam shaft 150, the cams 194 and 195 make one clockwise rotation, causing the lever 190 to rock the driving segment 188 first clockwise and then counterclockwise back to its normal position. During this clockwise movement, the segment 188, by means of the shoulder 187 in cooperation with the foot 186 of the latch 184, carries said latch and the amount actuator 175 clockwise in unison therewith until the rounded surface 196 contacts the stem of the depressed key 161. When this occurs, the latch arm 182 and its companion arm 183 are rocked counter-clockwise to disengage the foot 186 from the shoulder 187 to interrupt the clockwise movement of the actuator 175 and to arrest said actuator after it has moved an extent commensurate with the value of the key 161 which has been depressed. This engaging movement of the latch 184 moves a rounded extension 197 thereof into engagement with the corresponding one of a series of locating notches 198 on a plate 199 secured between the rod 178 and an upward extension of the left-hand support plate 177.

After the latch 184 is disengaged from the shoulder 187 of the segment 188, said segment continues its clockwise movement without interruption, causing an arcuate surface 200 thereof, in cooperation with the sole of the foot 186, to lock the extension 197 of the latch 184 in the notch 198 corresponding to the value of the depressed amount key 161. When the lever 190 and the segment 188 reach the termini of their initial movement clockwise, a roller 201 carried by the lever 190 engages an arcuate surface 202 on the under side of an amount beam 203 pivoted at 204 to the actuator 175 and forces an arcuate surface on the upper edge of said beam 203 to contact the hub of said actuator 175 to position the beam 203 in proportion to the value of the depressed amount key 161. The beam 203 has a slot 205, which engages a stud 206 in a link 207, the upper end of which is pivotally connected to an alining segment 208 mounted on one of a series of nested tubes 209 supported by a shaft 210 journaled in the side frames 121 and 122.

The lower end of the link 207 is pivotally connected to a segment 211 freely mounted on a shaft 212 journaled in the side frames 121 and 122. The segment 211 carries a stud 213, which engages a camming slot in a zero elimination cam plate 214 pivotally mounted on a stud 215 in a segmental gear 216 free on a shaft 217 also journaled in the side frames 121 and 122. The teeth of the segmental gear 216 mesh with the external teeth of an external-internal ring gear 218, the internal teeth of which mesh with a pinion 219, which drives a square shaft 220. The square shaft in turn drives similar pinions meshing with the internal teeth of the gears similar to the gear 218, the external teeth of which gears are adapted to mesh with and drive corresponding denominational type wheels 221 in each row of the column printing mechanism, which column printing mechanism in the present case is for the purpose of printing on the payroll summary 151, the check 152, and the earnings record 153, as has been previously described.

This method of driving the type wheels of the column printing accounting machine is fully explained in the previously mentioned Arnold Patent No. 2,141,332 and embodies an application of the well-known Kreider principle of driving mechanism disclosed in the above-mentioned Kreider Patent No. 1,693,279.

For the purpose of properly alining the differential mechanism and the type wheels set thereby, there is provided on each of the segments 208 a series of notches 222 engaged by an aliner 223 secured to a shaft 224.

The aliner 223 is disengaged from the notches 222 during the differential setting of the type wheels 221, and, after they have been set under the control of the keys 161 through the differential mechanism, the aliner 223 is again moved into engagement with the notches 222, thus positively alining the type wheels 221 during printing.

The amounts set up on the type wheels 221 are indicated through an opening 225 (Figs. 1 and 2) by indicators 226 set up from the gears 218 (Fig. 3) by means of gears 227, which operate pinions and square shafts, not shown, but like the pinions 219 and the shafts 220.

The zero elimination mechanism above mentioned, which is for the purpose of controlling the printing of zeros and which is controlled by the above-mentioned zero elimination cam plate 214, is not directly involved in the invention in the present application, and therefore no further reference to the zero elimination mechanism will be given herein. Such type of zero elimination mechanism is illustrated and described in the above-mentioned Arnold Patent No. 2,141,332.

Totalizers

The machine shown in this application has the usual three lines of totalizers, numebered 1, 2, and 3 in Fig. 3. As before stated, totalizers on each of these lines are split between the keys 160 and 161 (Fig. 2); that is, there is no transfer mechanism between the first left-hand group of keys 160 and the first right-hand group of keys 161 in connection with their respective differential mechanisms, which are shown in Fig. 3. The No. 1 totalizer line is also shown in the diagrammatic view (Fig. 27). This line of totalizers is controlled by the keys 164 of row 2. This No. 1 line has on the right-hand side of the split a balance totalizer or crossfooter, and also one straight adding totalizer. On the left of the split, the totalizer line has two adding totalizers on it, as shown in Fig. 27.

The No. 3 or front totalizer line, which is controlled by the keys 165 of row 3, has nine totalizers on each side of the split, one for each of the keys A to J and one in the zero position, herein called the "G. T. 3" totalizer.

The rear or No. 2 totalizer line has nine adding totalizers on each side of the split, one for each of the keys R, S, T, X, N, M, L, and K and one for the Net pay key, and also one in the zero position called the "G. T. 4" totalizer.

The No. 1 or upper totalizer line has crossfooters and also regular adding totalizers thereon, as above mentioned. Such construction is illustrated in the co-pending application of Pascal Spurlino, William M. Carroll, Arthur R. Colley, and Alfred G. Kibler, Serial No. 376,670, filed January 30, 1941, for Accounting machines, which

issued into Patent No. 2,375,594 on May 8, 1945. If any further information is needed or desired with reference to such totalizer lines having crossfooters and straight adding totalizers thereon, reference may be had to that patent.

The crossfooter on the upper or No. 1 line, which crossfooter is at the right of the split, is indicated by the reference number 230, and the straight adding totalizer on the right of the split of this line is 231. The two totalizers on this No. 1 line at the left of the split are numbered 232 and 233.

The totalizers on the No. 2 or back line are shown only in Fig. 3 and are numbered 234. This number applies to the totalizers on both sides of the split. The totalizers on the front or No. 3 line are numbered 235, and this number likewise applies to the totalizers on both sides of the split.

Totalizers of this type are old and well known in the art and are known as interspersed totalizers and are fully illustrated and described in the previously mentioned Shipley patents, and therefore no further description of the construction of these totalizers is felt necessary herein.

As is usual in machines of this type, the actuators 175 are divided into three tooth sections Nos. 236, 237, and 238 (Fig. 3). The section 236 actuates the crossfooter and also the regular totalizers on the No. 1 or upper totalizer line, the section 237 actuates the totalizers 234 on the No. 2 or rear line, and the tooth section 238 actuates the totalizers 235 on the front or No. 3 line.

In adding operations, the wheels of the selected totalizer or totalizers, as the case may be, are engaged with their respective sets of actuating tooth sections 236, 237, and 238 of the actuators 175, after said actuators have completed their setting movements in a clockwise direction under the control of the amount keys 160 and 161.

Return movement counter-clockwise of the actuators 175, as explained above, rotates the corresponding wheels of the selected and engaged totalizer or totalizers, in proportion to the value of the depressed amount keys 160 and 161, to enter into said totalizers the amounts corresponding to the keys which have been depressed.

In subtract operations, the corresponding subtract wheels of the crossfooter 230 are engaged with the teeth 236 of the actuator 175 exactly the same as in adding operations, and the return movement of the actuator reversely rotates the adding wheels 230 of the crossfooter through the reverse gearing shown in Fig. 3, which is well known in the art and shown in several of the above-mentioned Shipley patents and also in the last-mentioned co-pending application of Spurlino, Carroll, Colley, and Kibler, now Patent No. 2,375,594.

If no amount key 161 is depressed, the zero stop pawl 173 remains in the path of the spider 174 upon the initial movement of the actuator 175 and engages said spider and disengages the latch 184 from the driver 188 to arrest said actuator 175 in the zero position. After the actuator 175 is positioned at zero, the roller 201 positions the beam 203, the link 207, and the segments 208 and 211 in proportion thereto, as shown in Fig. 3.

At the end of any type of operation, the actuator 175 is always returned to home position, as shown in Fig. 3. However, the links 207 and the printing mechanisms controlled thereby remain in set positions at the end of machine operations and are moved directly from these positions to their new positions in the succeeding operations of the machine, through the beam mechanism, which is old and well known in the art and is often referred to as the "minimum movement device." The usual transfer mechanism is provided for entering one unit in the next higher order of the totalizers when the lower order totalizer wheel passes through zero, in either positive or negative direction.

Totalizer engaging and disengaging mechanism.

After the several totalizers on the various lines have been selected for operation by means under control of the keys in rows 2, 3, and 4, by means to be described hereinafter, the totalizers are moved into engagement with and out of engagement from their actuators during adding time, during totaling time, and during total-transferring time, which will now be described. During adding time, the actuators are first set and then the totalizers are engaged therewith, after which the actuators are restored to their normal positions, during which time the amounts set up under control of the amount keys 160 and 161 are added into or subtracted from the crossfooter and are added into the selected totalizer in the front line No. 3 or the back line No. 2.

During reading operations, the totalizers are engaged with the actuators before the actuators are moved in a clockwise direction, and the amount on the totalizers is taken therefrom and set up on the actuators and from there set up on the printing wheels, after which the actuators are restored to their normal positions and the totalizers are permitted to remain in engagement therewith, so that the amount which was taken therefrom is put back into that totalizer. When the totalizer is cleared, the totalizer is engaged with the actuator and the actuator is moved clockwise a distance depending upon the amount which is in the totalizer, after which the totalizer is disengaged from that actuator, and then the actuator is restored to its normal position, leaving the totalizer at zero.

During the transfer of totals from one totalizer line to another—for example, from the crossfooter on the top line of totalizers to a selected totalizer on the back or No. 2 totalizer line—the crossfooter is first engaged with the actuators prior to their clockwise movement, so that, during such clockwise movement, the amount on the crossfooter is taken therefrom and put upon the actuators, after which the selected totalizer on the rear or No. 2 line is engaged with those actuators and the crossfooter is disengaged therefrom, so that, when the actuators are restored counter-clockwise to their normal positions, the amount which was taken from the crossfooter will be transferred into the selected totalizer on the No. 2 line.

The mechanism for accomplisihng the engaging and disengaging of the totalizers under the conditions just above mentioned will now be described.

The crossfooter on the top totalizer and the other totalizer on this line, and all the totalizers on the rear line, and all totalizers on the front line, are each supported in a shiftable framework 240 (Fig. 3), which in turn are supported between the main frames 121 and 122 of the machine sections.

The shiftable framework 240 for the upper totalizer line, which carries the crossfooter, includes a shaft 241 (Figs. 3 and 7) having mounted on opposite ends thereof rollers 242, which engage similar slots 243 in cam plates 244 secured

to the machine side frames 121 and 122. These slots 243 are radial with the center of the tie rod 180 of the differential mechanism. This type of construction is clearly shown in the above-mentioned Shipley Patent No. 1,619,796.

Also secured near the opposite ends of the shaft 241 are similar cranks 245 having rollers 246, which engage similar cam slots 247 in the cam plates 244. The righthand crank 245, as shown in Fig. 7, has pivotally connected thereto one end of an engaging link 248 having a stud 249, which cooperates with a corresponding hook 250 of a spider 251 rotatably supported by a stationary stud 252. Movement is imparted to the engaging spider 251 by a totalizer engaging slide 253 having a slot in a forward extension thereof which engages a stud 254 of a cam plate 255 pivoted on a stationary stud 256. The cam plate 255 has a slot 257, which is connected by a stud 258 to a substantially vertical slot 259 in one arm of a yoke 260 also rotatably supported on the stud 256. The stud 258 is secured to a link 261, which is pivotally connected to a crank 262 secured on a shaft 263 supported by the side frames 121 and 122. Another arm of the yoke 260 carries a stud 264, which engages a camming slot in a total control plate 266 (Fig. 32), which is differentially positioned under control of the keys 162 and 163 of row 1 (Fig. 2) in a manner fully illustrated and described in the above-mentioned Shipley and Goldberg patents.

The manner in which the control plate 266 controls the movement of the yoke 260 and the manner in which the shaft 263 controls the movement of the crank 262 to in turn control engaging of the slide 253 with the spider 251 are also fully described in the above-mentioned Shipley and Goldberg patents, and therefore only a general description of this mechanism will be given herein.

A rearward extension of the slide 253 is pivoted to the upper end of a cam lever 270, only a portion of which is shown in Fig. 7. This lever 270 is operated by a box cam 271 secured to the main drive shaft 150. The cam race for this box cam is not shown, as this mechanism is old and well known in the art, and is of such a shape as to cause the slide 253 to be moved first to the right (Fig. 7) in the direction of its length, and then restored back to the position shown in Fig. 7 during each rotation of the shaft 150.

The shifting of the link 248 to control the engaging of the stud 249 with the hook 250 of the spider 251 is controlled in adding operations by the usual and well-known notched control disks, which are in turn controlled by the keys of rows 2, 3, and 4 (Fig. 2), and the engaging movement of said link is controlled in said total and total-taking operations by a slot in the total control plate 266 (Fig. 32) in a well-known manner.

When the total control plate 266 is in adding position, a notch 272 in the slide 253 is in engagement with a stud 273 in the spider 251, as shown in Fig. 7, and, when the stud 249 is engaged with the hook 250 of the spider 251, the lever 270, under influence of the cam race in the cam 271, shifts the slide 253 rearwardly or to the right, as viewed in Fig. 7, to impart a clockwise movement to the spider 251. Such clockwise movement of the spider 251, through the link 248, rocks the crank 245 and the shaft 241 counter-clockwise, causing the rollers 246, in cooperation with the cam slot 247, to shift the shaft 241 and the totalizer framework 240 (Fig. 3) to engage the selected set of wheels on the crossfooter or to engage the other totalizer on this upper totalizer line with the actuators 175.

As previously explained, in adding and subtracting operations, the engaging of the selected set of wheels with the actuators occurs after the actuators have been positioned under control of the depressed amount keys 160 or 161, and return movement counter-clockwise of said actuators 175 rotates said selected wheels in proportion to the value of the keys depressed, to enter therein the amount set up on the keyboard. After the actuators 175 have completed their return movement counter-clockwise, the cam 271 returns the slide 253 forwardly to return the spider 251 counter-clockwise to disengage the wheels of the engaged totalizer from the amount actuators 175.

In sub-total taking operations, the movement of the total control plate 266 away from adding position to sub-total position, whenever the "gross" key 162 is depressed, imparts an initial clockwise movement to the shaft 263 and sets up a condition which causes added clockwise movement to be imparted to said shaft 263 later in the sub-total taking operation. Initial movement clockwise of this shaft 263 shifts the stud 258 downwardly in relation to the slots 257 and 259; however, this downward movement of the stud 258 is confined to the straight portion of the slot 259, and consequently the notch 272 in the slide 253 remains in engagement with the stud 273 of the spider 251, as shown here.

It will be recalled that, in sub-total and total-taking operations, the main shaft 150 and the cams secured thereon receive two clockwise rotations instead of one, as in adding and subtracting operations: During the first rotation of the cam 271, the lever 270 moves the slide 253 rearwardly to engage the selected totalizer wheels with the actuators 175 prior to their initial movement clockwise, as said actuators are retained in their zero positions during the first cycle of a sub-total or total-printing operation.

The first cycle of a sub-total or total-taking operation is utilized to shift the totalizer lines laterally to select the desired set of totalizer wheels thereon for reading or resetting, as the case may be. During the second cycle of a sub-total or total-taking operation, the actuators 175, in their initial movement clockwise, reversely rotate the wheels of the selected totalizer until the long teeth on said wheels locate said wheels in their zero positions to position the amount actuators 175 in proportion to the amounts on said totalizer wheels. After the amount actuators 175 are thus positioned in proportion to the amount standing on the wheels of the selected totalizer, the roller 201 (Fig. 3) engages the beam 203 to position the segment and the printing mechanism in proportion to the amount on the totalizer wheels, or, in other words, to set up the amount which was taken from the totalizer wheels.

In sub-total taking operations, after the slide 253 has completed its initial movement rearwardly to engage the selected totalizer wheels with the amount actuators, additional movement is imparted to the shaft 263 to cause the stud 258, in cooperation with the cam slot 257 and the slot 259, to impart a clockwise movement to the plate 255, to disengage the notch 272 from the stud 273 so that the wheels of the selected totalizer will not be disengaged from the amount actuators 175.

In sub-total taking operations, the notch 272

remains thus disengaged from the stud 273 until near the end of the second cycle of operation of the shaft 150, and consequently the selected totalizer wheels remain in engagement with the amount actuators 175 during their return movements counter-clockwise, and, as a result, said totalizer wheels are restored to their original positions. After the totalizer wheels have been returned to their original positions, and near the end of the second cycle of operation, the shaft 263 is returned counter-clockwise to engage the notch 272 with the stud 273, so that return movement forwardly of the slide 253 near the end of the second cycle of operation will impart return movement counter-clockwise to the engaging spider 251 to disengage the wheels of the selected totalizer from the amount actuators 175.

In total-taking or clearing operations, the movement of the total control plate 266 from adding position to total or clearing position imparts initial movement clockwise to the shaft 263, exactly as in sub-total taking operations, and, in addition, said total control plate 266, in combination with the stud 264, rocks the yoke 260 and the plate 255 clockwise, which, through the stud 254, rocks the slide 253 counter-clockwise to disengage the notch 272 therein from the stud 273. Near the end of the first cycle of the total-taking operation, and after the slide 253 has been shifted rearwardly under the influence of the cam 271, additional clockwise movement of the shaft 263 causes the stud 258, in cooperation with the slots 257 and 259, to rock the plate 255 a further distance clockwise to engage a notch 274 in the slide with a stud 275 in the spider 251.

Immediately after the notch 274 is engaged with the stud 275, return movement of the lever 270 shifts the slide 253 forwardly to impart clockwise movement to the engaging spider 251 to cause the wheels of the selected totalizer to be engaged with the amount actuators 175 at the end of the first cycle of movement of the shaft 150. In the second cycle, the amount actuators 175 turn said wheels to zero in exactly the same manner as in sub-total or reading operations. While the selected totalizer wheels are thus standing at zero, and prior to the return movement counter-clockwise of the amount actuators 175 (Fig. 3), initial movement of the cam 271 in the second cycle of operation of the shaft 150 shifts the slide 253 rearwardly to impart counter-clockwise disengaging movement to the spider 251, to disengage the wheels of the selected totalizer from the amount actuators, thus leaving said wheels in a zeroized condition. After the spider 251 has thus been returned counter-clockwise to normal position, and prior to return movement forwardly of the slide 253, the shaft 263 is partially returned counter-clockwise to cause the stud 258 to return the cam plate 255 to disengage the notch 274 from the stud 275. While the slide 253 is thus disengaged from the spider 251, the cam 271 returns said slide forwardly to normal position, after which return movement of the yoke 260 and the plate 255 counter-clockwise engages the notch 272 with the stud 273, as shown in Fig. 7.

A pawl 276 (Fig. 7), which is actuated by a cam slot 277 in the cam plate 255, engages notches 278 and 279 in the spider 251 in sub-total and total-taking operations to hold said spider against displacement while the slide 253 is disengaged from the studs 273 and 275.

Further to align the spider 251 and the slide 253 at certain times during the machine operations, there are provided aligners 280 and 281 connected by a pin-and-slot connection 282. A link 283, pivoted to the aligner 280, is operated by a cam (not shown) secured to the main drive shaft 150 to cause the aligner 280 to cooperate with the stud 273 on the spider 251 and also to cause the aligner 281 to cooperate with a stud 284 on the end of the slide 253 to insure that the slide 253 will properly engage the stud 273 or 275, as the case may be.

The No. 2 or back totalizer line (Fig. 3) has the full complement of totalizers thereon; that is, it has ten totalizers, one in the zero position and one in each of the other nine positions. The "G. T. 4" totalizer in the zero position and the "Total net pay" totalizer in the No. 9 position are adapted to be automatically selected during certain types of operations, as has been mentioned above, to have amounts transferred into those totalizers when such amounts are cleared from other totalizers.

In other words, when the Earnings to date key 162 (Fig. 2) is operated, the amounts on the "G. T. 3" totalizer in the zero position in row 3 are cleared from this totalizer and transferred into the "G. T. 4" totalizer in the zero position on the back line. Also, as has been stated above, when the Net pay key 162 is operated, the crossfooter in the No. 1 or top totalizer line is cleared, and the amount taken therefrom is automatically transferred into the "Total net pay" totalizer on the back totalizer line.

Transfer total mechanism

Inasmuch as it is desirable to transfer amounts from the crossfooter or balance totalizer on the top line into the total net pay totalizer in the back line, and also from the "G. T. 3" totalizer in the front line to the "G. T. 4" totalizer in the back line, it is necessary to provide means different from the regular totalizer line engaging mechanism to control the engaging and disengaging movement of the No. 2 or back totalizer line.

Such mechanism is illustrated particularly in Figs. 6 to 9 inclusive.

The No. 2 or rear totalizer line is mounted in the shiftable frame 240, which is similar in every respect to the frame 240 for the upper totalizer line. This particular framework for the back totalizer includes a shaft 300 having mounted on each end thereof rollers 301 (only one shown here), which cooperate with guide slots 302 in totalizer engaging cam plates 303 mounted on the inside of the side frames 121 and 122. On each end of the shaft 300 are engaging cranks 304 carrying rollers 305, which cooperate with cam slots 306 in the cam plates 303.

The crank arm 304 on the right-hand end of the shaft 300, as shown in Fig. 7, is connected by a hub 307 to an arm 308 having a slot 309, through which extends a stud 310 carried by a shifting plate 311, which is bifurcated to embrace a hub 312 on the shaft 300. This stud 310, which is carried by the plate 311, extends through the other side of the plate and has mounted thereon a roller 313, which is normally maintained in engagement with a notch 314 of a plate 315 by a spring 316 stretched between a stud on the plate 311 and a stud on the arm 308. This plate 315 is secured to the hub 307 and therefore pivots about the center of the shaft 300. Pivoted to the plate 315 is a link 317, which carries a flattened stud 318 adapted

to cooperate with a hook 319 of the engaging spider 251.

The link 317 for the No. 2 or back totalizer line is controlled in exactly the same manner as the link 248 for the No. 1 or upper totalizer line in adding and subtracting operations, by means of selecting disks, which in turn are controlled by the keys of rows 1, 2, and 3, and in sub-total and total-taking operations by the total control plate 266 to control the engagement of the stud 318 with the hook 319 of the engaging spider 251.

Under normal condition, the roller 313 remains in engagement with the notch 314 of the plate 315, thus connecting said plate to the arm 308, which in turn is connected with the crank 304 and the shaft 300, and under these conditions the No. 2 or rear totalizer line receives its engaging and disengaging movements under control of the engaging spider 251 in exactly the same manner as described above for the No. 1 or upper totalizer line. However, when it is desired to clear the crossfooter and transfer the amount cleared therefrom, which is the net pay and which occurs when the Net pay key 162 is depressed, into the Total net pay totalizer on the No. 2 or back line, it is necessary to have other means for shifting the control of the engaging and disengaging movement of the No. 2 or back totalizer line so as to cause the No. 2 line to be engaged with and disengaged from the actuators in adding time, which, it will be recalled, is necessary in order to have the amount transferred into the selected totalizer on this line.

The means provided for such shifting will now be described. The stud 310, which is carried by the plate 311, projects into a forked arm 320 (Figs. 7 and 8) secured to a shaft 321 supported by the right-hand machine frame 122 and the auxiliary frame 124. Secured to the shaft 321 is an arm 322 having pivoted thereto a link 323, which is also pivoted to a crank 324 mounted on a rod 325 supported by the side frame 122 and the auxiliary frame 124. The crank 324 has a finger 326 extending at right angles thereto, which cooperates with a segmental arm 327 pivoted on the shaft 212. This arm 327 is secured to a segment 328, which meshes with a segment 329 secured to a sleeve 330 mounted on a shaft 331 supported by the right side frames 122 and the auxiliary frame 124. Also secured to the sleeve 330 is a segment 332 (Fig. 32), which meshes with a segment 334 pivoted on the shaft 212. The segment 334 is secured to an arm 335, to which is pivoted a link 336 also connected to the total control plate 266. It will be recalled that the total control plate 266 is moved differentially under control of the keys 162 and 163 of row 1 (Fig. 2), and therefore the differential movement of the total control plate 266 through the train of mechanism just described differentially positions the segmental arm 327 (Fig. 7) according to the position of the key 162 or 163 which is depressed. As shown in Fig. 7, the finger 326 on the crank 324 cooperates with the true periphery of the segmental arm 327 in the zero position. Adjacent this position, the segmental arm 327 is provided with a notch 337, which corresponds to the positions of the Net pay key 162 and the Earnings to date key 162. Consequently, whenever either one of these keys is depressed, the notch 337 is presented to the finger 326, thus allowing the crank 324 to be rocked clockwise, whereupon the finger 326 is moved into the notch 337. The means for rocking the crank 324 clockwise includes an arm 338 secured to the shaft 321, which arm is moved in a clockwise direction by a spring 339 at the proper time during the operation of the machine, to draw the finger 326 into the notch 337. When this occurs, the shaft 321 is rocked clockwise, thus rocking the arm 320 clockwise and moving the stud 310 downwardly into the slot 309 of the arm 308. This downward movement of the stud 310 causes a roller 340 (Fig. 6) carried thereby to be moved into a U-block 341 secured to an arm 342 pivoted on the shaft 300. Pivoted to the arm 342 is a link 343, which is also pivoted to a lever 344 mounted on a stud 345 carried by the auxiliary frame 124. This lever 344 carries rollers 346 and 347, which cooperate with companion cams 348 and 349, respectively, mounted on a shaft 350, which is in axial alignment with the main cam shaft 150 and which shaft 350 is driven from the main shaft 150 through a clutch mechanism to be described hereinafter, so that the latter shaft 350 will not be operated during the first cycle of a two-cycle totaling or transfer total operation. However, during the second cycle thereof, the cams 348 and 349, through the lever 344 and the link 343, rock the arm 342 counterclockwise, and, since the roller 340 is in engagement with the U-block 341, this roller 340 and the stud 310 will be carried counter-clockwise around the shaft 300 with the arm 342. Since the stud 310 projects through the slot 309 of the arm 308, this arm 308 will be rocked counter-clockwise and the crank 304 will be rocked likewise, whereupon the cam slot 306 (Fig. 8) will cause the totalizer line to be engaged with the actuators 175 to have the amount which was taken from the upper totalizer line No. 1 transferred to the selected totalizer on this back totalizer line No. 2.

In order to free the finger 326 from the periphery of the segmental arm 327, to permit the latter to be moved freely by the control plate 266, a cam 351, secured to a shaft 352 carried by the side frame 122 and the auxiliary frame 124, contacts a roller 353 on the arm 338, rocking the arm slightly in a counter-clockwise direction against the tension of the spring 339, to move the finger 326 away from the periphery of the segmental arm 327 so that it can be moved differentially under control of the keys 162 and 163 in row 1. This shaft 352 is driven each operation of the main cam shaft 150 by means of a gear 354 (Fig. 30), which is secured to the main cam shaft 150. This gear 354 meshes with a gear 355 secured to the shaft 352. Consequently the shaft 352 is given two counter-clockwise rotations during each reading operation, totaling operation, and transfer total operation by the shaft 150. The cam 351 is so timed that, during the first operation of the shaft 352, the arm 338 will be moved slightly counter-clockwise and then allowed to rock clockwise when the high part of the cam 351 passes the roller 353 and finally be restored by the cam to its normal position. However, during the second cycle, after the high portion of the cam 351 has passed the roller, then the spring 339 will again actuate the arm 338 and the shaft 321 in the manner described above, to move the stud 310 and its roller 340 into a coupled position whereby the back totalizer line No. 2 will be engaged with the actuators 175 by means of the cams 348 and 349, which are secured to the shaft 350 and which operate only during the second cycle of a total or transfer totaling operation.

The means for driving the shaft 350 (Figs. 7 and 30) from the main cam shaft 150, so that the shaft 350 will be disabled during the first cycle

of all two-cycle operations—or, in other words, of all reading operations, total-taking operations, and transfer total operations—will now be described. Rigidly secured to the previously described gear 354, which is fast to the main drive shaft 150, is a plate 360 (Fig. 30), which receives two complete rotations during every total-taking operation. This plate 360 has secured thereto, between itself and the hub of the gear 354, a collar 361. The shaft 350 is supported adjacent the right end thereof in the auxiliary frame 124, and, since the shaft 350 is in axial alignment with the shaft 150, the other end of the shaft 350 extends about midway into the collar 361, through the plate 360. The shaft 150 also extends about midway into the collar 361. Carried by the plate 360 is a driving pawl 363 adapted to cooperate with a shouldered collar 364 securely fastened to the shaft 350. The plate 360 carries another pawl 365, which cooperates with another shoulder on the collar 364 to prevent any backward movement of the collar 364 and consequently of the shaft 350. A spring holds the pawls 363 and 365 normally in contact with the opposite shoulders of the collar 364. As the gear 354 is driven clockwise, as viewed in Fig. 30, the plate 360 is driven likewise, whereupon the pawl 363 drives the collar 364 and consequently the shaft 350 clockwise in the same direction simultaneously with the movement of the shaft 150. Secured near the end of the shaft 350 is a gear 366 meshing with an intermediate gear 367 mounted on a stud 368 supported by the auxiliary frame 124. The gear 367 drives a gear 369, which is secured to a main drive shaft 370 for the printer.

From the above description, it will be clear that, when the shaft 150 of the machine is driven clockwise one rotation during adding operations, the auxiliary aligned shaft 350 will be given a movement of like extent by means of the plate 360, the pawl 363, and the collar 364, and, through the gearing described above, the printer drive shaft 370 will receive one complete clockwise movement during each adding operation of the machine.

During the first cycle of a total-taking operation, a sub-total taking operation, or a total transfer operation, it is necessary that the shaft 370 be moved a very short distance, approximately 40 degrees, but during such operations the shaft 150 receives two rotations in a well-known manner. In order to arrest the shaft 370 after such short rotation and during the very first part of the first cycle of any two-cycle operation, an arm 371 is moved into the path of travel of a finger 372 on the pawl 363 and causes said pawl to be disengaged from the collar 364, and therefore the shaft 350 remains idle during the remainder of the first rotation of all sub-total, total, and transfer total operations.

The means for moving the arm 371, as described above, is fully illustrated and described in the above-mentioned Shipley Patent No. 1,619,796 and is occasioned by the first short movement of the shaft 263 (Fig. 5) under control of the total control plate 266. However, during the second rotation of any total-taking or two-cycle operation, the pawl 363 is again permitted to contact the shoulder 364 and drive the shaft 350, and consequently the shaft 370 completes one rotation during the second cycle of all total-taking operations.

There is a means provided to insure that the shaft 370 and also the shafts 350 and 150 are always stopped in their exact home positions. This mechanism is controlled by the previously described key lock line or shaft 149. It will be recalled that this shaft, when the machine is released, is given a clockwise movement, and that it is restored counter-clockwise to normal near the end of each operation of the machine. This shaft 149 has secured thereto an arm 373 connected by a link 374 to a bell crank 375, which in turn is connected by a link 376 to an arm 377. The arm 377 has an integral arm 378 cooperating with a stud 379 secured to the gear 369.

In Fig. 30, the parts are in their normal positions, with the arm 378 immediately underneath the stud 379 on the gear 369. When the machine is released, the shaft 149 and the arm 373 are given their clockwise movement, and, through the linkages just described, the arm 378 is moved from beneath the stud 379 to allow the gear 369 and the shaft 370 to be driven in a clockwise direction. However, before this shaft 370 completes its cycle of movement, the key lock shaft 149 is restored counter-clockwise to its normal position, thus reversing the direction of movement of the linkage just described, whereupon the arm 378 will again be moved into the position shown in Fig. 30, so that, when the shaft 370 reaches its home or normal position, the stud 379 will contact the top of the arm and prevent any further movement of the shaft 370. Through the gearing drive between the shaft 370 and the shaft 350, the shaft 350 is likewise stopped in its normal position, as is also the main cam shaft 150.

Transaction keys, total keys, their differentials, and drive mechanism to the printer and indicator

As hereinbefore stated, the present machine has three rows of transaction keys Nos. 164, 165, and 166. These transaction banks of keys are numbered or designated rows 2, 3, and 4 in the diagrammatic view of the keyboard in Fig. 2.

Since all of the functions of the keys 164, 165, and 166 have been previously stated, it remains only to describe the general mountings for the keys, the differential mechanisms associated therewith, and the drive from those differential mechanisms to the printer and indicator.

Since all of the differential mechanisms associated with these three rows of keys are substantially identical, only one has been illustrated, and therefore the description of this one will suffice for all.

The one illustrated in Fig. 5 is the differential mechanism associated with row 2, or, in other words, keys 164. In Fig. 5 are shown part of the keys 164 of row 2 and part of the keys 165 of row 3. The keys of all three rows—that is, keys 164, 165, and 166—are all carried by individual key frames 390 mounted on the rods 171 and 172, which are supported by the side frames 121 and 122. Since the construction of practically all of the keys is the same as those shown in the patents mentioned at the beginning of this specification, it is not necessary to go into a general description of the keys and all of their characteristics herein. Referring particularly to the diagrammatic view of the key stems as shown in Fig. 12, all of the keys 162 of the total row have pins 392, each of the keys 163 has a pin 393, the keys 164 have pins 394, the keys 165 have pins 395, and the keys 166 have pins 396.

Various control bars and control levers are shown associated with these four rows of keys, and wherever a pin of a particular key cooperates

with one of the particular bars either in its own row or in an adjacent row, an X, or, in other words, cross-lines, are drawn across the pins, directly over the control bar or control lever with which it cooperates. Several of these levers are used in connection with an automatic mechanism to be hereinafter described. Referring now particularly to row 2, or in other words, the keys 164 (Fig. 12), that is, the pins 394 of the keys 164 cooperate with the usual locking detent or bar 400, the usual control bar 401, and the well-known overdraft lock release bar 402. The key pins 395 of the keys 165 of row 3 cooperate with the usual locking detent or bar 403 and also a regular control bar 404. The key pins 396 of the keys 166 also cooperate with the usual locking detent or bar 405 and also the usual control bar 406. The movements of these bars just described by the keys, and to lock the keys are very old and well known in the art, and fully described and illustrated in the above-mentioned Shipley Patent No. 1,619,796, and therefore it is not felt that it is necessary to go into any further description of these locking and control bars at this time.

As shown in Fig. 5, the row 2 keys 164 do not have any zero stop pawls associated therewith, but the "Account No." key 164 has a special offset foot 407 thereon to stop the differential in this bank in the zero position whenever this key is depressed in the manner to be described hereinafter.

As has been stated above, the keys 162 to 166, through their differential mechanisms, control various sections of the printer through what is known in the art as a control line to be hereinafter described to control the hammers for printing upon the payroll summary 151, the check 152, and the earnings card 153. They also control the feeding of the payroll summary and of the earnings record and of the check, and control the back feed of the check and also control the ejection of the check. This control line is of the Kreider type of construction mentioned in the above-mentioned Kreider patent and will be specifically described later on in connection with the printing mechanism. However, under the present heading, the drives from the various differentials down to the control line, over to the type line and also to the indicators, will be described.

Referring particularly to Fig. 5, the drive shaft 150 carries a pair of cams 410 for operating a lever 411 connected by a link 412 to the usual driving segment 413. The driving segment 413 and other parts of the differential mechanism are supported by the rod 180. The segment 413, through the usual latch 415 carried by a differentially adjustable arm 416 supported by the rod 180, rocks the arm 416 clockwise until the forward end of the latch 415 contacts whichever one of the keys 164 is depressed, at which time the latch is separated from the driving segment 413, permitting the arm 416 to remain in the position to which it has been driven under control of the depressed key 164.

It might be stated here that there are other conditions which will be explained hereinafter and which are known as the automatic control for the differential from keys in other banks which control this differential breaking or disconnection of the latch 415 from the driving segment 413 so that the differential arm 416 will be stopped in a position depending not upon the key 164 but upon the automatic mechanism controlled either by a key in this same bank or by keys of other banks, so that the differential will be stopped in other positions.

The differential arm 416 carries the usual minimum movement beam 417, connected to a link 418, which at its upper end is connected to an aligning segment 419 pivoted on the shaft 210. The lower end of the link 418 is pivoted to an arm 421 secured to the shaft 212. This arm 421 is connected by a link 422 to a segment 423 pivoted on the shaft 217. The segment 423 meshes with the external teeth of an external-internal gear 424, the internal teeth of which drive a pinion 425 on a square shaft 426 to set up type 427 in various columns to print data under control of the keys 164 on the payroll summary 151, the check 152, and the earnings record 153.

The gear 424 also drives a gear 428 and a square shaft 429 of the usual internal gear drive mechanism of the Kreider type, to indicate through the opening 225 (Fig. 2).

Also secured to the shaft 212 is a gear segment 430 meshing with a pinion 431 secured to a gear 432, both of which are pivoted on the stud 433 carried by the base 123. The gear 432 meshes with a gear 434 of the internal-external type to drive a pinion 435 on a square shaft 436 (Figs. 5 and 105) to control various printer functions, as above stated, from the keys 164 of row 2.

The differential mechanism associated with the keys 165 of row 3 is substantially identical with that just described in connection with row 2, and this differential, through its beam mechanism (not shown), sets a link 438 (Fig. 30), which is pivoted to an arm 439 pivoted on the shaft 212. The arm 439 is connected by a link 440 to a segment 441 meshing with the external teeth of an internal-external gear 442, which in turn drives a pinion 443 on a square shaft 444 to set up type 445 under control of the keys 165 of row 3. The above-mentioned segment 441 is secured to the shaft 217, and there is also secured to this shaft a gear segment 446 meshing with a pinion 447 fast to a gear 448, which meshes with an internal-external gear 449, which drives a pinion 450 on a square shaft 451 so that the differential positioning of the gear 449 under control of the keys 165 of row 3 may be set in the several columns to control the printing of data on the payroll summary 151, the check 152, and the earnings record 153.

The gear 442 drives a gear 452 to drive a square shaft 453 to set indicators for row 3 to indicate through the opening 225 (Fig. 2).

The keys 166 of row 4 (Fig. 2) also control a differential mechanism which is substantially like that shown and described in Fig. 5 for the keys 164. This differential sets a link 460 (Fig. 31), which is pivoted to an arm 461 pivoted on the shaft 212. A link 462 connects the arm 461 with a segment 463 pivoted on the shaft 217. This segment 463 meshes with the external teeth of an internal-external gear 464, which drives the pinion 465 on the square shaft 466 to set type wheels 467 to control the printing of data in the selected columns on the payroll summary 151, the check 152, and the earnings record 153.

The gear 464 drives a gear 458 and a square shaft 459 to set indicators for row 4 to indicate through the opening 225 of Fig. 2.

Rigidly connected to the arm 461 is a segment 468 meshing with a segment 469, which is secured to the previously described shaft 331. Also secured to this shaft is a segment 470 mesh-

ing with the external teeth of an external-internal gear 471, the internal teeth of which drive a pinion 472 on a square shaft 473, which is for the purpose of controlling various functions of the printing mechanism to be described hereinafter.

The differential mechanism associated with the keys 162 and 163 is of the same substantial principle as that disclosed in the above-mentioned Goldberg Patent No. 2,175,346, except that the add position for the differential mechanism in the present application—that is, the position which the differential assumes when no keys are depressed—is one position below the "Net pay" key, as indicated in Fig. 12, whereas, in the differential mechanism of the Goldberg patent, the normal or adding position of the differential is midway between the keys of the bank in that patent.

The differential mechanism under control of these keys 162 and 163 also effects a control of the control line through the following mechanism. It will be remembered that the control plate 266 operates a link 330, which is pivoted to an arm 335 loose on the shaft 212. Integral with this arm 335 is an arm 474 connected by a link 475 to a segment 476 meshing with the external teeth of an internal-external gear 477, which drives the pinion 478 on a square shaft 479 to set type 480 to print on the various printing mediums which are used in this machine. It will also be recalled that the segment 334 is secured to the arm 335 and that this segment 334 meshes with a segment 332 secured to a sleeve 330 on the shaft 331. Also secured to this sleeve 330 is a segment 481 meshing with the external teeth of an internal-external gear 482, which drives a pinion 483 on a square shaft 484 to effect control of certain of the printing control elements in the machine in a manner to be hereinafter described in detail.

The gear 477 drives a gear 485 and a square shaft 486 to set indicators to indicate through the opening 225 of Fig. 2.

Automatic control of differential of row 2 from the "Prior earnings" key in row 2; the control of the differential of row 4 from the "Net pay" key 162; automatic control of the differential of row 2 from any and all of the keys 165 of row 3 and the keys K, L, M, and N 166 of row 4

The latch 415 associated with the row 2 keys 164 (Fig. 5) carries a pin 490 projecting into an arm 491 pivoted on the rod 180. Integral with the arm 491 is a plate 492 carrying a stop lug 493. Also pivoted on the rod 180 and associated with the keys 164 of row 2 is a lever 494 (Figs. 4, 12, and 14) having a finger 495 adapted to cooperate with the pin 394 of the "Prior earnings" key 164. Pivoted to the lever 494 is a link 496, which is also pivoted to an arm 497, which is loosely mounted on a shaft 498 carried by the side frames 121 and 122. The arm 497 has a bail 499, which is connected to an arm 500, also pivoted on the shaft 498. The lever 494 is held in its normal position in Fig. 14 by means of a pin 501 on an arm 502 pivoted on a rod 503 supported by the frames 121 and 122. This pin 501 lies in contact with an upstanding arm 504 of the lever 494 and normally maintains the lever 494 in the position shown in Fig. 14. A bar 505 is secured to the base of the arm 502 and is also secured to an arm 506 (Fig. 5), to which is pivoted a link 507 connected to an arm 508 secured to the key lock shaft 149. When this shaft receives its clockwise movement upon the release of the machine, the arms 506 and 502 are rocked counterclockwise to move the pin 501 from in front of the arm 504 to allow a spring 509 to rock the lever 494 clockwise until the finger 495 thereon strikes the pin 394 of the depressed "Prior earnings" key 164. This short movement of the lever 494 is communicated to the link 496, the arm 497, the bail 499, and the arm 500, to position said arm 500 directly in the path of the lug 493 on the plate 492, consequently causing this plate 492 to stop when the lug 493 strikes the arm 500 as the differential arm 416 is moved upwardly, thus causing the latch 415 to be disengaged from the driving segment 413 and set the beam 417 and the link 418 in accordance with the position of the lug 493, which is the automatic position, or, in other words, position 1 in row 2, which corresponds to the "Account No." position, which selects the "G. T. 2" totalizer in row 2 to have the prior earnings accumulated therein. At the same time, this prior earnings is accumulated in the "G. T. 3" totalizer, which is in the zero position of row 3, due to the fact that the zero stop pawl of row 3 is not moved out, and consequently the differential for this row is stopped in the zero position, so that the prior earnings will be added into the "G. T. 3" totalizer on the front line No. 3 and also into the "G. T. 2" totalizer on the upper line No. 1.

If a wrong deduction should be made, it is necessary to add this amount back into the crossfooter again, so that the net pay will be correct, and, in order to do this, the operator depresses the Plus key 164 of row 2. Associated with this key is a lever 510 (Figs. 4, 12, and 23) having a finger 511 cooperating with the pin 394 of the Plus key 164. The arm 510 has an integral arm 512 cooperating with a pin 513 on the arm 506, which, it will be recalled, is operated by the shaft 149. Pivoted to the upstanding arm 512 is a link 515 connected to an arm 516 pivoted on the shaft 498. The arm 516 has a flange 517 secured to a yoke 518 of an arm 519, which cooperates with a block 520 on the plate 492 (Fig. 21). This arm 519 and plate 520 are for the purpose of automatically selecting the minus side of the crossfooter 230 (Fig. 27) for the purpose of subtracting the deductions from the employee's gross pay.

However, since a correction is being made by adding back into the crossfooter the amount of an erroneous deduction, after the depression of the Amount keys 161 to set up the amount erroneously deducted, and then depressing the Plus key 164, it is necessary to select the add side of the crossfooter 230, and consequently the automatic selection of the minus side must not function. Therefore the lever 510 receives only a short step of movement before the finger 511 strikes the pin 394; consequently the arm 519 is not moved far enough to get into the path of the block 520, and so the differential for row 2 will not be stopped in the fifth position according to block 520, but will go on up to the ninth position to select the plus side of the crossfooter. The pin 513 (Fig. 23) is moved downwardly away from the finished surface of the arm 512 by the key lock shaft 149, as above described, and, when this occurs, a spring 521 rocks the lever 510 clockwise until its finger 511 contacts the pin 394, as just described, and, through the linkage 515 and the arm 516, the arm 519 is, as above mentioned, moved only one-half step, or a short movement,

so that it is not positioned in front of the block 520.

If an amount has been erroneously added to the employee's regular pay, such as a premium or dividend erroneously added, in order to correct this, the operator resets the amount on the keys 161 which has been wrongly accumulated, and then depresses the Subtract key or minus key 164, which causes the differential of row 2 to stop in the sixth position to select the minus side of the crossfooter 230, as shown in Fig. 27 by the diagram.

Now, in order to select the minus side of the crossfooter 230, when any one of the Deduction keys of row 3 is depressed, or when any of the Deduction keys 166—that is, the K, L, M, or N key of row 4—is depressed, there is an automatic means for setting the differential mechanism of row 2 into the fifth position in order to select the subtract side of the crossfooter 230. This mechanism will now be described.

Associated with row 3 is a lever 522 (Figs. 4, 12, and 21) having nine fingers 523, one for cooperating with each of the pins 395 of the keys 165 of row 3. Secured to the lever 522 is a bar 524 (Figs. 4, 12, and 22) having four fingers 525 to cooperate with the pins 396 of the K, L, M, and N keys 166 of row 4. The lever 522 has an upstanding arm 526 cooperating with a pin 527 of an arm 528 pivoted on the rod 503 and connected to the previously described bar 505, which is operated through the key lock shaft 149 in the manner above described, to move the pin 527 away from the finished surface of the upper part of the arm 526. When this occurs, a spring 529 rocks the lever 522 clockwise until one of the fingers 523 thereon strikes the pin 395 for the depressed key, or until one of the fingers 525 (Fig. 22) strikes the pin 396 of one of the depressed four lower keys 166 of row 4. This clockwise movement of the lever 522, through a link 530 pivoted thereon and an arm 531, which is integral with the yoke 518, rocks the arm 519 a full step of movement in a clockwise direction to position its left end in front of the block 520 on the plate 492, thus causing the differential mechanism associated with row 2 to stop in the "5" position, which automatically selects the minus side of the crossfooter 230 to have the deductions, designated by any of the keys 165 of row 3 or the four lower keys 166 of row 4, deducted from the gross pay, which is in the crossfooter.

Each of these amounts deducted is also accumulated into a totalizer associated with the particular key which is depressed. Due to the fact that there is no zero stop pawl associated with the differential mechanism for the keys 164 of row 2, whenever any of the keys R, T, S, or X 166 of row 4 is depressed to accumulate the amount of earnings for regular hours, the amount for overtime hours, or any premiums or bonuses, such amounts, in addition to being added into totalizers associated with those keys, are automatically added into the plus side of the crossfooter 230 because of the fact that this differential of row 2 will go to the 9 position, which selects the plus side of the crossfooter, as shown by the chart in Fig. 27.

When the Net pay key 162 is depressed, the amount on the crossfooter—that is, the net amount, which is the gross minus all of the deductions—is cleared from the crossfooter 230 and automatically transferred into the "Total net pay" totalizer associated with the Total net pay key 166 in the top position of row 4. In order to automatically select the totalizer in the top position of row 4, it is necessary to move the zero stop pawl in connection with that bank out of position so that the differential for row 4 may go to the ninth position to select this totalizer to have the net pay, which is cleared from the crossfooter, transferred thereinto.

The pin 392 of the Net pay key, therefore, operates on a finger 540 (Fig. 18) of a bar 541, which is supported at its lower end on a pivoted arm 542 carried by the key frame 390 for the keys of row 1. Depression of the Net pay key 162 causes its pin 392 to move the bar 541 downwardly, whereupon the arm 542 rocks a lever 543 counter-clockwise, which in turn rocks an arm 544 fast on a shaft 545 carried by the frame 411 for the total bank. Also secured to the shaft 545, adjacent the key frame 390 for row 4, is an arm 546 (Fig. 19), which cooperates with and rocks an arm 547 counter-clockwise. This arm 547 is rigidly connected to a zero stop pawl 548 associated with the differential mechanism for row 4. Therefore, it can be seen that depression of the Net pay key 162 will move the zero stop pawl 548 for row 4 out of the path of the differential latch for this bank, so that the differential will go to the 9 position and select the Total net pay totalizer, to have transferred thereto, by the mechanism previously described, the amount which is cleared from the crossfooter, which is the employee's net pay.

In order to prevent depression of the Minus key 164 of row 2 when the Net pay key 162 is depressed, there is associated with the Net pay key a lever 549 (Fig. 16) having attached thereto a spring 550, which normally holds a finger 551 against the under side of the pin 392 of the Net pay key. The lever 549 also has a finger 552, which is adapted to be moved underneath the pin 394 of the Minus key 164 when the Net pay key is depressed, because the depression of this key, through its pin 392, will, through the finger 551, rock the lever 549 counter-clockwise against the tension of the spring 550 and position the finger 552 directly beneath the pin 394 of the Minus key 164.

During analysis operations—that is, whenever the Analysis key 164 is depressed—it unlocks the three keys 164 in the first, second, and third positions of row 2, so that they may be used for distribution during analysis operations. These keys are normally locked in their undepressed positions by fingers 555 of a plate 556, which is secured to the lever 549. The plate 556 also has a cam finger 557, which cooperates with a pin 394 of the Analysis key, so that, whenever this key is depressed, it will move the fingers 555 from beneath the pins 394 of the three lower keys in row 2, to release these keys, and at the same time will move the finger 552 beneath the pin 394 of the Minus key 154, so that it cannot be operated during analysis operations.

PRINTER

Consecutive number mechanism

As has been previously described, the consecutive number is printed on the payroll summary 151 and on the check 152 when the machine is being used for payroll work, and is also printed on the ticket 156 when the machine is being used for analysis distribution work. The consecutive number is also indicated through an opening 558 (Figs. 1 and 2) in the cabinet 146.

The mechanism for operating the consecutive

numbering mechanism is shown in Figs. 35 and 38 and will now be described.

The main cam shaft 150 (Fig. 35) carries companion cams 560 and 561, which cooperate with rollers 562 and 563, respectively, on a lever 564 pivoted on the previously described shaft 331. The upper end of the lever 564 has a bayonet slot 565, into which projects a pin 566 carried by a link 567, which is pivoted at 568 to an adjustable plate 569 forked to surround a rod 570 carried by a bracket (not shown) supported by the machine side frame. The plate 569 is also secured to an arm 571 at point 572. There are two arms 571, only one being shown. The arms 571 are slotted to receive the ends of a rod 573, which is carried by a pair of plates 574 (only one shown), which are mounted on a support plate for a multiple shaft differential unit of the Kreider type, as described in the Kreider patent mentioned at the beginning of this specification. Pivoted on the rod 573 is a differentially tined pawl 575, which cooperates with ratchets 576 and disks 577 having deep notches arranged for the usual type of deep notch transfer mechanism in connection with differentially tined pawls, which is very old and well known in the art.

Since the ratchets 576 have thirty teeth therein, there are three deep notches 578 in the disks 577, so that every ten steps a transfer will be made to the consecutive number of next higher order in the usual manner. When the cams 560 and 561 are rotated, the pin 566, having been previously moved upwardly into the vertical section of the bayonet slot 565 by means to be described hereinafter, rocks the arms 571 clockwise by means of the link 567, whereupon the differentially tined pawl 575 functions to add one to the consecutive numbering ratchets 576 in the usual and well-known manner. A spring 579 restores the parts to their normal positions. A spring 580 maintains the differentially tined pawl in engagement with the ratchets 576. Connected to the ratchets 576, to be driven thereby through the square shafts shown in Fig. 35, are a series of gears 581 meshing with the external teeth of internal-external gears 582, which, through the square shafts inside the gears 582 and the pinions (not shown on those shafts), drive type wheels 583 to print the consecutive number on the payroll summary 151 and the check 152 when the machine is being used for payroll work, and upon the ticket 156 when the machine is being used for analysis distribution.

To indicate the consecutive number through the opening 558 in the cabinet 146, there are provided flanges 584 (Fig. 2), upon which are carried digit numbers to indicate the consecutive number.

Through the square shafts and pinions shown in Fig. 35, the consecutive number may thereby be printed in the various columns on the printing mediums, as above mentioned. A series of retaining pawls 585 (Fig. 35), only one of which is shown, are used to prevent any retrograde movement of the ratchets 576. These pawls are held in engagement with the ratchets by means of springs 586 connected between the ends of the pawls 585 and a hook on a bracket 587 mounted on the machine side frame.

It may be desirable to start the consecutive number at certain definite positions; that is, for example, it might be desirable to start the consecutive number advancing from, say, the number 500,000. If such is the case, the consecutive number indicators 584 and the ratchets 576 are adapted to be moved by hand until the desired number is set up, after which the consecutive number will advance in the usual manner by the mechanism shown in Fig. 35. The means for setting the consecutive number by hand includes a series of hand levers 590 secured to disks 591. Normally each disk is locked by means of a pin 592 on an arm 593 secured to a shaft 594 supported by the machine frames. By means to be described hereinafter, the pins 592 are moved out of the notches in the disks 591, to free them so that they may be moved by their hand levers 590. Each disk carries a feeding pawl 595 (Fig. 38) spring-pressed into contact with ratchets 596, which in turn are secured to the indicators 584 so that the indicators may be set to the proper number by the moving back and forth of the levers 590 until a desired consecutive number is indicated through the opening 558 (Figs. 1 and 2).

In order to move the pins 592 (Fig. 38) out of the disk 591 so that the consecutive number may be set by hand, a lock 597 (Fig. 1) controls a bolt 598 (Fig. 34) to move the bolt out of a notched disk 599.

After the bolt 598 has been moved out of the notch in the disk 599, a hand lever 600 (Fig. 34) drives an internal pinion 601, which meshes with the disk 599 and which also drives a pinion 602 to drive pinions 603 and 604 (Fig. 37), which in turn set plates 605 and 606 having cam slots cooperating with a pin 607 on an arm 608 secured to the shaft 594. From the above it can be clearly seen that, when the lever 600 is in the position shown, the pin 592 will be in the position shown in Fig. 38, and the pin 607 will be in the position shown in Fig. 37. When the lever 600 is moved to the "Consecutive number locked position" (Fig. 34), the plate 606 is moved to cam the associated pin 607 to move an arm 609, fast on a shaft 610, which is in axial alinement with the shaft 594. This movement of the lever 600 has not moved the plate 605, and consequently the pin 607 in the arm 608 has not been moved. However, when the lever 600 (Fig. 34) is moved into the "Consecutive number unlocked position," then the plate 605 cams the pin 607 in the arm 608 and moves the shaft 594 counter-clockwise a distance sufficient to bring the pin 592 out of the notch in the disk 591 and releases the consecutive number mechanism so that it may be set by hand. The plate 606 is associated with the date mechanism which will be described a little later.

Data setting mechanism

The date is indicated through an opening 611 (Figs. 1 and 2) and is printed on the check 152 or on an envelope 154 (Fig. 26) and also on the ticket 156 when the machine is used for analysis distribution.

To indicate the date, flanges 612 (Fig. 2) are provided to show the date through the opening 611. The date is set up by means of hand levers 613 (Figs. 1 and 36) secured to a disk 614 having internal teeth which drive pinions and square shafts of the Kreider type of mechanism, so that it may be printed in the various columns necessary and so that it may be indicated through the opening 611 in the cabinet. The date is locked, when the lever 600 is in the position shown in Fig. 34, by means of a pin 615 (Fig. 36) in an arm 616 fast on the shaft 610. There is one arm 616 and pin 615 and disk 617 for each of the date indicating flanges 612. When the lever 600 is in the position shown in Fig. 34, the pin 615, through the disk 617, locks the date lever 613 so

that it cannot be moved. When the lever 600 is moved to the "Date unlocked" position, the plate 606 (Fig. 37) rocks the pin 607 in the arm 609 to rock the shaft 610 counter-clockwise to remove the pins 615 from the disks 617. When the lever 600 is moved forward to the "Date unlocked" position, the pin 607 merely rides on the true periphery of the plate 605, thus allowing the pin 615 to stay out of the notch 617 to leave the date unlocked.

In other words, the lever 600 controls the consecutive number lock position and the date lock position. In the first position to the left of that shown in Fig. 34, the consecutive number will be locked and the date will be unlocked, and, in the second position forward of the lever 600, the consecutive number will be unlocked and the date will also be unlocked.

The disks 614, which are set by the levers 613 through the pinions and square shafts, set up internal-external gears 618 (Fig. 34), which, through internal-external gears 619 and the square shaft, drive the date type wheels 620 so that the date, according to the setting of the levers 613, may be printed on the check or envelope and also on the ticket.

All of the sets of square shafts and internal and external drive pinions and gears shown in Figs. 34 to 37 are carried by a series of brackets 621 (Fig. 41 and 42) that are secured to the tie bar 125 and the base 123.

As shown in Fig. 41, the lower or right-hand group of square shafts are carried by the plates themselves, and, in order to take this unit out of the machine, the plates must come off. However, the upper left-hand set of square shafts and pinions are mounted in special plates 622, there being one pair of plate for each of the brackets 621, so that this upper left-hand unit may be removed from the machine without taking the brackets 621 off of the machine.

There is a device used in connection with the date and consecutive number mechanisms which will prevent the machine from being operated unless the date levers 613 are in their proper positions and also unless the consecutive number levers 590 are in their proper positions. This is effective through an aliner mechanism which will now be described.

Referring particularly to Figs. 33 and 34, the key lock line or release shaft 149 (Fig. 33) has fastened thereto a plate 625 connected by a link 626 to an arm 627 pivotally mounted on a shaft 628 supported by the machine side frames 121 and 122. Fast on the shaft 628 is an arm 629 having a stud 630, which is held against the arm 627 by a spring 631 connected between studs on the arms 627 and 629. The arm 629 has a stop finger 632 contacting the tie bar 125 to hold the parts in their normal positions. The shaft 628 has secured thereto an arm 633 (Fig. 10) having pivoted at 634 a driving pawl 635. The pawl 635 has a lateral lug 636 (Fig. 11) held underneath a shoulder 637 of an arm 638 by a spring 639 (Fig. 10). The arm 638 is loose on the shaft 628.

When the shaft 149 is rocked clockwise upon release of the machine, the link 626 rocks the arm 627 clockwise and, through the stud 630, rocks the shaft 628 clockwise, whereupon the arm 633 (Fig. 10) is moved in a clockwise direction, and the lug 636 will at this time rock the arm 638 clockwise and move a toe 640 thereon above an arm 641, which is integral with an alining bail 642, which cooperates with serrated disks 643. The bail 642 is wide enough to engage several of the disks 643, one for each of the date wheels and one for each of the consecutive number wheels. If the serrated disks 643—that is, any one of them—holds the aliner 642 out—that is, to the right from the position shown in Fig. 11—the integral arm 641 thereof will be up in front of the toe 640 on the arm 638, and consequently the arm 638 cannot be moved clockwise thereby. The arm 633 (Fig. 34) will be locked by the lug 636, and consequently the shaft 149 cannot be rocked clockwise to release the machine.

A spring 644 holds the alining bail 642 against the serrated disks 643, and consequently the bail 642 merely ratchets over the disks 643 when the consecutive number or the date is being set by hand or when the consecutive number is being operated by the mechanism of the machine shown in Fig. 35.

In order that the key lock shaft 149 may be restored at the proper time, it is necessary to disengage the lug 636 (Fig. 11) from the shoulder 637 of the arm 638, and this is accomplished by means of a cam 645 (Fig. 34) secured to the main cam shaft 150. The cam 645 operates a pitman 646 pivoted to a lever 647 mounted on a shaft 648 supported by the side frames 121 and 122. The lever 647 engages a stud 649 in an arm 650 fast on a shaft 651 supported by the machine side frames. Also secured to the shaft 651 is an arm 652 adapted to contact a roller 653 carried by the pawl 635 and rock the pawl 635 counterclockwise about its pivot 634 to release the lug 636 from the shoulder 637 of the arm 638 so that the shaft 149 may be restored to its normal position near the end of the operation of the machine.

The cam 645 is also used to operate an alining mechanism for the internal-external gears 619 and also for the type wheels 620. Fast on the shaft 651 is a pair of arms 654 (only one shown) carrying an aliner bar 655 adapted to contact and aline the gears 619 and other gears in alinement therewith after the type wheels have been set. In order further to aline the type wheels, an aliner bail 656 is carried by a disk 657 having an arm 658 normally contacting a pin 659 in an arm 661 secured to the shaft 651. When the shaft 651 is rocked counterclockwise by the pitman 646, the aliner 655 alines the gear 619, as above mentioned, and the pin 659 is moved to the right, whereupon the aliner bail 656 engages the type wheel 620, and the pin 659 then engages a notch 662 in the arm 658. When the pitman 646 restores the shaft 651 clockwise to its normal position, it raises the aliner bail 655 and rocks the arm 661 clockwise, whereupon the pin 659 cams the arm 658 downwardly and rocks the disk 657 to raise the aliner 656 from the type wheel 620.

All of the type wheels 427 associated with row 2, the type wheels 445 associated with row 3, the type wheels 467 associated with row 4, the type wheels 480 associated with row 1, the consecutive number type wheels 583, and the date type wheels 620, shown diagrammatically in Figs. 58—A and 58—B, are mounted on a shaft 665 supported by the brackets 621, which carry the internal drive mechanisms for setting the type wheels and the indicators, which indicators are shown in Fig. 2.

Hammers

The hammers for printing on the payroll summary 151, the check 152, and the earnings record 153 are all shown diagrammatically in Figs. 58—A and 58—B and are numbered 701 to 729 inclusive. The hammers 701 to 711 print in columns 1 to 11

on the payroll summary 151; the hammers 712 to 719 print in columns 12 to 19 on the payroll check 152; and the hammers 720 to 729 print in columns 20 to 29 on the earning record 153. All of the hammers 701 to 719 inclusive are pivoted on a shaft 730 (Figs. 42—A, 42—B, and 99), and all of the hammers 720 to 729 inclusive are pivotally mounted on a shaft 731 (Fig. 42—B). The shaft 730 is supported by the printer frames 131, 132, 133, and 134, and the shaft 731 is supported by the printer frames 135 and 136.

All hammers are driven by four sets of companion cams 732 and 733, all identically the same and all secured to the printer drive shaft 370, shown in Figs. 46—A, 46—B, and 99. The companion cams 732 and 733 cooperate with rollers 734 and 735, respectively, of bell cranks 736. All of these bell cranks 736 between the frames 132 and 134 are secured to a shaft 737, and all bell cranks between the frames 135 and 136 are secured to a shaft 738 in axial alinement with the shaft 737. Pivoted to each of the bell cranks 736 is a link 739 to directly operate the hammers 707, 714, 718, and 723. Also secured to the shafts 737 and 738 are arms 740, which have pivoted thereto links 739 identical with the link 739 shown in Fig. 99. All of these arms 740 and their pivoted links 739 are directly associated to operate all of the other hammers from 701 to 729 except the hammers 707, 714, 718, and 723, which, as just above described, are operated directly from the bell cranks 736. All of these links 739 are perfectly flat except the one associated with the hammer 726, as shown in Fig. 46—B, and this particular link is offset slightly. Each of the links 739 has a notch 741 cooperating with a pin 742 on a lever 743 pivoted on a rod 744 supported by the printer frames 131 to 134 inclusive. These levers 743 on the rod 744 cooperate with the hammers 701 to 719 inclusive. Supported by the frames 135 and 136 (Fig. 42—B) is another rod 745, in axial alinement with rod 744, upon which rod are pivoted the levers 743 associated with the hammers 720 to 729 inclusive.

Pivoted to each of the levers 743 to connect said levers to each of the hammers 701 to 729 is a link 746. In Fig. 99, the parts are shown in their normal positions, with the hammer down away from the type wheels and maintained in this position by a finger 747 of the lever 743 contacting the tie bar 138.

As shown in Fig. 99, the link 739 is disengaged from the pin 742 in the normal position; however, the particular hammers 701 to 729, which are to be operated for the various cycles of operation which constitute a complete transaction of issuing a pay check, are operated during different ones of these particular operations. The links 739 associated with the hammers to be operated under control of the keys and various other controlling devices to be described hereinafter are rocked counter-clockwise about their right-hand ends to cause the notches 741 to engage the pins 742. With the pins 742 engaged by the notches 741, when the shaft 370 is given its clockwise rotation, the links 739 are moved to the right and to rock the levers 743 counter-clockwise, whereupon the toggle links 746 raise the hammers 701 to 729 inclusive (that is, the selected ones of this group of hammers) to contact their associated groups of type wheels as shown in Figs. 58—A and 58—B. This contact of the hammers with the type wheels is made at the high point of the companion cam 732, and, immediately after the roller 734 passes off the high point, the levers 743 are rocked clockwise and the links 746 lower the hammers to the position shown in Fig. 99.

Hammer controls

For the various operations which constitute a complete transaction to print an employee's pay check 152, with all the data thereon, and print the proper data on the payroll summary 151 and on the earnings record 153, the different hammers 701 to 729 inclusive (Figs. 58—A and 58—B) are controlled by various mechanisms in the machine, such as the control rows 1, 2, 3, and 4 (Fig. 1) and feeling mechanisms for the payroll summary for the earnings record and for the check.

The hammers 701 to 729, as has been previously mentioned, are adapted to print in their respective columns 1 to 29 on the summary 151, the check 152, and the record 153. These hammers are controlled by the various rows of control keys 162 to 166 at different times, sometimes directly from the keys and other times from the automatic positioning of the latch and its associated differential mechanism of the particular row that is controlled by keys in another row.

The feelers for the summary, the check and the record, and the control rows of keys operate a control line composed of notched disks which are set by the well-known Kreider pinion and square shaft driving mechanism, fully illustrated and described in the Kreider patent mentioned at the beginning of this specification.

This control line is shown diagrammatically in Fig. 105, and the assembled line is shown in Figs. 57—A and 57—B. The line—that is, all of the plates and the mechanisms including the square shafts and the internal pinions—is supported on a large square shaft 750, which is supported by the printer frames 131 to 136 inclusive.

By referring to Fig. 105, several of the square shafts and their controls have already been described in connection with the differentials of rows 1, 2, 3, and 4, and the shafts controlled by said differentials are numbered 434, 436, 451, and 473, respectively. This control line also contains four other shafts, as follows: a shaft 751, controlled by a printer control lever, to be described hereinafter; a shaft 752, controlled by the record card feeler; a shaft 753, controlled by the check feeler; and a shaft 754, controlled by the payroll summary feeler. All of these feeler mechanisms will be described hereinafter.

The above-mentioned selecting plates of the control line, which are set under the control of the keys of rows 1, 2, 3, and 4, and under the control of the summary, the check, and the record feelers, and also under control of the printer control lever, are shown in groups in Figs. 57—A and 57—B, and, instead of numbering each plate in each group, the groups which control the hammers 701 to 729 inclusive are numbered 801 to 829 inclusive, to control the printings in columns 1 to 29 inclusive. Most of these groups of control plates are shown in chart form in Figs. 64—A and 64—B, and in Fig. 65. In Figs. 64—A and 64—B, there are four plates to the group, with one exception, which is noted in the chart, and in Fig. 65 there are three plates in the group, with five exceptions, which are noted in the chart. The hammer number and the plate group number are given in the chart so that they can be readily traced and followed in the drawings in Figs. 57—A and 57—B.

All of the notches which are cut in the vari-

ous plates of all of the groups are indicated in the charts, and there is also indicated whether the particular plate in the group is controlled by the record feeler, the summary feeler, or the check feeler, and also by which rows of control keys they are controlled.

In addition to the hammer number and the plate group number, there are also noted the functions accomplished by that hammer; for example, in Fig. 65, in the space numbered 6 it shows hammer 702, plate group 802, which control the printing of the gross and net on the summary 151 in column 2.

In all cases, the plates of each group are numbered plate 1, plate 2, plate 3, etc., in the charts, and in all cases plate No. 1 is the right-hand plate of each of the groups of control plates shown in Figs. 57—A and 57—B. No. 2 plate is the second from the right, No. 3 the third from the right, and so on. As has been previously mentioned, to operate the hammers 701 to 729, (Figs. 58—A and 58—B) it is necessary to move their associated links 739 (Figs. 46—A, 46—B and 99) downwardly to engage the pins 742 in the operating levers 743. It was also stated that this moving of the links 739 is under control of the control rows of keys and also the feelers for the summary, the check, and the record.

Each one of the links 739 has pivoted thereto a link 760, which in turn is pivoted to a lever 761 journaled on a shaft 762. The lever 761 has a finger 763, held in contact with a stud 764, on an arm 765, by a spring 766. The arm 765 is secured to the shaft 762.

There is a lever 761 associated with each of the control plate groups 801 to 829 inclusive (Figs. 57—A and 57—B), and each one of these levers carries pivoted thereon a feeler block 767 having two sets of fingers, an upper set and a lower set, and each lever 761 has a finger shaped like the lower finger on block 767, all of which fingers are arranged to cooperate with notches which are cut in the groups of plates according to the charts shown in Figs. 64—A and 64—B, and in Fig. 65.

To rock the shaft 762 in a counter-clockwise direction so that the spring 766 for each of the arms 761 may rock those arms counter-clockwise, whereupon the fingers of the blocks 767 may cooperate with the plate groups 801 to 829 inclusive, there are secured to the shaft 762 three arms 768 (Figs. 40, 57—A, and 57—B)

The levers 761, the arms 765, and a single arm 768, which cooperates with the plate groups 820 to 829 inclusive for the earnings record, and which lie between printer frames 135 and 136, are all mounted on a shaft 769 (shown only in Fig. 57—B), which is in axial alinement with the shaft 762. The levers 761 are journaled on this shaft 769, and the arms 765 and the single arm 768 are secured to this shaft. A link 770 is pivotally connected to each of the three arms 768 which are secured to the shaft 762, as shown in Fig. 40, and each of these links in turn is pivoted to a bell crank 771 (Figs. 46—A and 46—B), which cooperates with companion cams 772 and 773 secured to the printer cam shaft 370. There are an arm 768, a link 770, and a bell crank 771 like those in Fig. 40, which cooperate with the cams 772 and 773, which are located on the shaft 370 between the frames 135 and 136 (Fig. 46—B). This bell crank 771 is journaled on the shaft 738.

When the shaft 370 is rotated clockwise, the bell cranks 771 and the links 770 will rock the arms 768 and the shafts 762 and 769 counter-clockwise to move all of the arms 765 in a like direction, whereupon the springs 766 (Fig. 99) will tend to rock all of the levers 761 in a counter-clockwise direction, depending upon whether or not the upper fingers or the lower fingers of the feeling blocks 767 cooperate with a single line of notches in the particular plate group 801 to 829 inclusive with which they cooperate.

When either the upper finger or the lower finger of the block 767 finds notches in all of the plates of its respective group, then the lever 761 will be permitted to rock in a counter-clockwise direction by its spring 766, whereupon its link 760 will lower the link 739 and cause its notch 741 to engage the pin 742 of the hammer operating lever 743, whereupon the hammer will be operated by the cams 732 and 733 in the manner described previously.

All of the hammers, beginning with 701 and ending with 729, will now be discussed in connection with their operations under control of their associated and respective plate groups 801 to 829 inclusive.

Considering now the consecutive number hammer 701, the plate group which controls the operation of this hammer is 801 (Fig. 57—A) and is shown in space 3 of the chart on Figs. 64—A and 64—B. This chart shows that plate No. 1 is controlled by the summary feeler and that it has a notch cut in the Arabic zero position. Plate No. 2 is controlled by the check feeler, and it has a notch in both the Arabic and Roman zero positions. Plate No. 3 is controlled by the differential of row 2, and this plate has notches cut in the 2, 3, 4, and 9 Arabic positions and in the II, IV, and IX Roman positions, which means that, when the machine is being used for payroll runs, since the differential for row 2 goes to the 9 position when the Net pay key 162 is depressed, there must be a notch in the 9 position on both the Arabic and Roman positions on the plate. Plate No. 4 is controlled by row 1, and on the Arabic side there is a notch in the zero position and in the sixth position, the zero position representing the add position of the differential and the sixth position representing the Clear row 4 position. On the Roman side, a notch is in the I, IV, and V positions, the No. I representing the Net pay position, and the Nos. IV and V representing the Clear row 2 and Clear row 3 positions, respectively.

The finger formed on the lever 761 (Fig. 99) cooperating with the plate No. 1 is located in the lower position, and therefore, it is not necessary to notch out any of the Roman positions on this plate No. 1. Therefore, from the above notch cuttings, as shown in space 3 of this chart, it will be clear that the consecutive number hammer 701 will have its link 739 coupled to the operating lever 743, due to the fact that, when the net pay is printed on the check under control of the Net pay key, the consecutive number will be printed on the payroll summary 151 by the hammer 701, because the upper fingers of the selecting block all find notches in the 9 position for the plate No. 3 controlled by row 2 and in the 1 position for plate No. 4 controlled by row 1. A check 152 and a summary sheet 151 must be in the machine, as the feelers for them control the first two plates in group 801 to set notches opposite the fingers of the block 767.

Hammer No. 702 (Fig. 58—A) prints the gross and net pay of the employee in column 2 on the payroll summary 151. This hammer is controlled by plate group 802, as shown in space 6 of the

chart in Fig. 65, which chart also shows that the three plates are cut with notches so that the gross and net are printed only upon the operation of the Gross and Net keys 162, respectively, of Fig. 2.

Hammer No. 703 (Fig. 58—A) is controlled by plate group 803, as shown in space 4 of the chart (Figs. 64—A and 64—B), to print the regular number of hours and the overtime hours, which are controlled by keys R and T in the seventh and eighth positions of row 4 (Fig. 2). The earnings all go into the plus side of the crossfooter, which is in position 9 of row No. 2, and during this time the differential of row 1 must be in the add position. Therefore the chart shows that the notches are cut in the proper positions on the Arabic side to print the regular and overtime hours in column 3 of the payroll summary 151. The plate No. 1 shows a notch in the zero position as controlled by the summary feeler. The notches shown on the Roman positions for this group of plates show that, during analysis totaling operations, the hammer 703 can be operated to print in column 3 on the analysis strip 155.

Hammer 704, which prints in column 4 of the payroll summary 151, is controlled by the plate group 804, as shown in space 5 of the chart, Figs. 64—A and 64—B, and is controlled to print the amount in exactly the same manner as the hammer 703 is controlled to print the hours. As a matter of fact, the hours and the amounts for those hours are printed during one and the same cycle of operation of the machine, the only difference in the plate groups being that in group 804 the plate No. 1 is omitted, since it is not necessary to have a feeler plate control for the amount, since there is one for the hours.

The hammer 705, which prints in column 5 on the payroll summary, is controlled by plate group 805, as shown in space 6 of the chart, and the notches in the control plates are so cut that the printing in column 5 will follow the printing in columns 3 and 4 on a separate operation whenever special earnings are made.

Hammers 707 to 711 inclusive, which print in columns 7 to 11, respectively, on the payroll summary, are controlled by plate groups 807 to 811, respectively, to print the deductions on the payroll summary, as shown in spaces 7 to 12 of the chart on Figs. 64—A and 64—B, which chart shows that the control plates 1 to 4 of these groups above mentioned are so cut that the deductions will be printed in the columns according to the keys which are designated at the head of the respective columns.

Hammer 712, which is controlled by plate group 812, shown in space 13 of the control chart (Figs. 64—A and 64—B, prints the regular and overtime hours on the check 152 at the same time that the hours are printed in column 3 of the payroll summary 151, and the chart shows that the plates 1, 2, 3, and 4 are notched for such printing.

Hammer No. 713, which prints in column 13 on the check 152, is controlled by plate group 813 (Fig. 57—A). This plate group 813 consists of five plates, which are shown in Figs. 50 to 54 inclusive, and there is a note at the left of these figures which reads as follows: hammer 713, plate group 813, column 13, to tie up these plates with the particular column of the check in which they print. This hammer is also adapted to print in column 13 of the ticket 156, shown in Fig. 125, during analysis operations. The plates 1 to 5 of this plate group 813 in Figs. 50 to 54, inclusive, are all notched so that the amount for the regular hours and the amount of pay for the overtime hours are printed during the same time that the regular hours and the overtime hours are printed in column 12 on the check, and the notches are also cut so as to show that the hammer 713 prints the total earnings or gross upon the depression of the Gross key 162, which, it will be recalled, takes a reading operation from the plus side of the crossfooter, which is in the ninth position of the differential associated with the keys of row 2.

The notches cut in the plate group 813 in the Roman position are for the purpose of printing at the proper time in column 13 on the ticket 156 during analysis operations.

Hammer 714, which is controlled by plate group 814, as shown in space 14 of the control chart (Figs. 64—A and 64—B), shows that the plates are cut to cause the hammer 714 to print deductions and are controlled by any of the keys of row 3 or any of the first four keys at the bottom of row 4.

Hammer 715, which prints the net pay in column 15 of the check 152, is controlled by a plate group 815, as shown in space 8 of the control chart in Fig. 65. The feeler plate No. 1 is cut with a notch in the zero position, and the plates Nos. 2 and 3 are cut with notches in the 9 and 1 positions, respectively, which positions are associated with the upper finger of the feeler block 767 so that the net pay will be printed from the ninth position of row 2 when the Net pay key 162 in row 1 is depressed.

Hammer No. 716, which prints the consecutive number on the check in column 16, is controlled by plate group 816, as shown in space 9 of the control chart of Fig. 65, which chart shows that the plates are cut so that the consecutive number on the check is printed during the time that the prior earnings are set up on the keyboard to be put into the "G. T. 2" totalizer in the first position of row 2, which, it will be recalled, is automatically selected by the differential of row 2 upon the depression of the Prior earnings key 164.

Hammer 717, which prints the date in column 17 on the check, is controlled by plate group 817, as shown in space 10 of the control chart (Fig. 65), which chart shows that the plates for this hammer are cut so that the date is printed at exactly the same time that the consecutive number is printed on the check, which is during the time of the entry of the prior earnings in the "G. T. 2" totalizer, which is selected as just above described.

Hammers 718 and 719, which print in columns 18 and 19 on the check, are controlled by the plate groups 818 and 819, as shown in spaces 11 and 12 of the control chart of Fig. 65. This chart shows that the plates are cut identically with the plates in group 815, which control the printing of the net pay on the stub portion of the check, so that the two amounts of the net pay will be printed in columns 18 and 19 on the main body of the check at the same time.

Hammers 720 and 721, which print in columns 20 and 21, respectively, of the earnings record 153, are controlled by plate groups 820 and 821, as shown by the control chart in Figs. 64—A and 64—B. This chart shows that the plates are cut so that the hours, both regular and overtime, and the earnings for those hours, both regular and overtime, are printed in columns 20 and 21 at the same time that the hours and the amount for the hours are printed in columns 2 and 3 on

the payroll summary 151, and in columns 12 and 13 on the check 152.

Hammer 722, which prints in column 22 of the earnings record whenever there are any special earnings, such as premiums or bonuses, is controlled by plate group 822, as shown in space 18 of the control chart (Figs. 64—A and 64—B). The plates in this chart show that the special earnings are printed in column 22 whenever the keys S or X, 166 (Fig. 2) are depressed to release the machine when such special earnings have been set up on the keyboard.

Hammers 723 to 728 inclusive control the printing in columns 23 to 28 inclusive of the earnings record 153 and are controlled by plate groups 823 to 828 inclusive, as shown in spaces 19 to 24 inclusive of the control chart (Figs. 64—A and 64—B) to print the employee's deductions in these columns 23 to 28, and the control plates are cut, according to this chart, so that these deductions will be printed whenever their respective deduction keys in rows 3 and 4 are depressed, along with the amounts of the deductions set up on the keyboard on the keys 161.

Hammer 729, which prints the gross and the earnings-to-date in column 29 on the earnings record 153 (Fig. 29), is controlled by plate group 829, as shown in space 13 of the control chart of Fig. 65, which chart shows that the plates are cut with notches so that the gross is printed, as controlled by the crossfooter, by hammer 729 during the operation with the Gross key 162 depressed, and the earnings-to-date is printed during the operation with the Earnings-to-date key 162 depressed, which earnings-to-date is printed from the total taken from the "G. T. 3" totalizer upon the depression of the Earnings-to-date key.

To aline all of the plate groups 801 to 829 inclusive, and also the other groups of selecting plates to be described hereinafter, there is provided at each end of the shaft 750, and arranged to be driven by the shafts 484, 436, 450, 473, and 751, a plurality of alining disks 780 (Figs. 57—A and 57—B), which are shown in side elevation in Fig. 48. Cooperating with each group of alining disks 780 is an aliner 781 carried by a lever 782 pivoted on a stud 783, one of which is carried by the frame 131 and the other by the frame 136. Each lever 782 carries a roller 784, held in contact with a plate cam 785 by a spring 786. The cams 785 are secured to the printer drive shaft 370 and are so timed that, after the selecting plates have been differentially positioned under control of the keys of rows 1, 2, 3, and 4 and also by the printer control lever at the left of the machine, the aliners 781 are moved into engagement with the notched disks 780 and are held in engagement therewith until after the plates have functioned to control the various parts of the machine, such as the hammers, feeding mechanisms, etc., which they are designated to control.

Consecutive number advance control

The consecutive number operating or advancing mechanism to advance the consecutive number 1 on certain types of operations of the machine is controlled from a group of selecting control plates, which group has been numbered 788, as shown in space 26 of the control chart (Figs. 64—A and 64—B). This plate group is also shown in Figs. 35 and 57—B. There are four plates in this group, and they are controlled from four sources. Plate No. 1 is controlled from a printer control lever 789 (Figs. 1 and 72), which will be later described in detail but which has three positions of adjustment, which are designated 0, 1, and 2, as follows: No. 0, payroll and dividends, during which operations the consecutive number operating mechanism should operate upon the depression of the Prior earnings key 164, so that for the next check the proper consecutive number will be printed thereupon and also upon the payroll summary 151. The 1 position on the lever 789 is marked Analysis—Consecutive number, which means that the consecutive number mechanism will operate when the lever 789 is in this position. The No. 2 position is designated Analysis—No consecutive number and means that, when the lever is in this position, the consecutive number operating mechanism will be disabled. As shown in space 26 of Figs. 64—A and 64—B, this lever controls plate No. 1 of group 788 and shows that the plate is notched in the No. 0 and No. 1 Arabic positions, which are the positions of the lever which control the consecutive number operating mechanism to operate, assuming that the other three control plates of this group, to be described now, are in their proper places. The second plate of group 788 is controlled by the check feeler, to be described hereinafter, and this plate No. 2 has notches in the zero Arabic position and also in the zero Roman position. The plate No. 3 is controlled by the differential of row 2 (Fig. 2) and shows that this plate is notched in the 2, 3, and 4 positions on the Arabic side, which takes care of the second, third, and fourth keys of this bank during analysis operations, and that this plate 3 has notches in the Roman II, IV, and IX positions, the Roman II and IV positions being for analysis and the Roman IX position being the automatic position of the row 2 differential whenever the Net pay key is pressed, so therefore there must be a notch in this position.

The plate 4 has notches in the zero and 6 Arabic positions, which take care of the clearing of row 4 during analysis clearing operations, and has notches in the Roman I, IV, and V positions, which take care of the Net pay key during payroll writing operations by the Roman I, the Roman IV and V positions taking care of the Clear row 2 and Clear row 3 keys to clear the totalizers of rows 2 and 3 during total-clearing or analysis operations.

Cooperating with this plate group is the usual block 767 carried by an arm 790 (Fig. 35), which arm has a lower finger cooperating with the plate No. 1 of the group 788, which finger is in alinement with the usual lower finger of the blocks 767. Pivoted to the arm 790 is a link 791, which is also pivoted to an arm 792 journaled on the shaft 738. This arm 792 carries a roller 793, which cooperates with a cam 794 secured to the printer drive shaft 370. Also pivoted to the lever 790 is a link 795, which is guided near its upper end on a stud 796 on the auxiliary frame 124 (Fig. 42—B). The upper end of the link 795 has a slot 797, through which projects the previously described pin 566, which is carried by the consecutive number operating link 567.

A spring 797, connected to the link 795, normally holds the roller 793 against the cam 794. When this cam is rotated and the low portion thereof is presented to the roller 793, the spring 797 will rock the arm 790 counter-clockwise, assuming that there is a notch in the three plates Nos. 2, 3, and 4 of the group 788 opposite the upper finger of the block 767. Since there is no upper finger on the arm 790, it is not necessary that a notch be in the Roman 0 position on the

plate No. 1 of the group 788. If the arm 790 can be rocked counter-clockwise due to the proper location of the notches, as shown in space 26 of the control chart (Figs. 64—A and 64—B), the spring 797 will raise the link 795 and move the pin 566 into the vertical portion of the bayonet slot 565 on the operating lever 564, so that, when this lever 564 operates, the consecutive number operating link 567 will be moved to advance the consecutive number mechanism one step. The slot 787 in the upper part of the link 795 takes care of the movement of the pin 566 to the left and back to its normal position. During payroll-run operations, these plates are set so that the consecutive number is advanced only during operations in which the Prior earnings key 162 is depressed.

If the lever 789 is moved to the No. 2 position, the plate No. 1 of group 788 is moved by means of a link 798 (Fig. 72) pivoted to a plate 799, which drives an internal pinion 800 on the square shaft 751, which, it will be recalled, is the shaft that operates the plate No. 1 of group 788, as shown in Fig. 35.

The lever 789 is pivoted on a plate 841 supported by three studs 842 carried by the printed frame 131, as shown in Figs. 39 and 72. The lever 789 carries a stud 843 cooperating with a lever 844 pivoted on a stud 845 on the plate 841. The lever 844 is guided near its right end by a headed stud 846 on the plate 841. The lever 844 has three notches 847, 848, and 849, with which the stud 843 on the lever 789 is adapted to cooperate. A spring 850 normally tends to rock the lever 844 counter-clockwise and the lever 789 counter-clockwise. The lever 844 in Fig. 72 is shown in the analysis consecutive number position with the stud 843 engaging the notch 847. When payrolls are being written, the lever 789 is moved to the left by its spring 850 when a fingerpiece 851 on the lever 844 is depressed, which allows the spring 850 to draw the lever 789 counter-clockwise until the stud 843 is above the notch 848, and then, when the fingerpiece 851 is released, the spring 850 will rock the lever 844 counter-clockwise and lock the lever 789 in the payroll and dividend position No. 0. When the lever 789 is in the Analysis—No consecutive number position No. 2, the stud 843 cooperates with the notch 849, which locks the lever in that position under the influence of the spring 850.

There is also means provided for positively locking the lever 789 in any position to which it has been set by the operator, the operator having the key for this purpose, which key fits a lock 852 supported by the plate 841. The nose of the lock 852 projects through the cabinet 146, as shown in Fig. 39. A special bolt 853 is provided to be moved beneath a flange 854, to prevent depression of the lever 844 by the operator manipulating the fingerpiece 851. When the parts are in the positions shown in Fig. 72, it will be noticed that the bolt is beneath the flange 854, and consequently the lever 789 is positively locked in this position until the lock 852 has been operated to remove the special bolt 853.

Summary feeler, check feeler, record feeler, operating mechanism, and their controls

When the machine is being used for payroll runs, the summary feeler controls mechanism to lock the machine if there is no payroll summary 151 in the machine, and during analysis operations, if there is no analysis strip 154 in the machine, the machine will be locked. During payroll run operations, the check feeler will cause the machine to lock if there is no check in its proper position to receive printing, and the earnings record feeler will cause the machine to lock if there is no earnings record 153 in the machine to receive the proper printing.

In view of the above conditions being necessary, a summary feeler 857 (Fig. 39) to cooperate with the payroll summary 151 is pivoted on the shaft 730 (Fig. 90), a check feeler 858 is pivoted on the shaft 730 to cooperate with the check 152, and an earnings record feeler 859 (Figs. 43—A and 43—B) is provided to cooperate with the earnings record 153. This feeler 859 is pivoted on the shaft 731.

The mechanisms for causing the feelers to be moved upwardly to cooperate with their respective printing mediums are all identically the same, and therefore a description of one will suffice for all. Referring particularly to Fig. 90, each of the feelers 857, 858, and 859 has pivoted thereto a link 860 pivoted near its middle on a stud 861 carried by an arm 862 journaled on the shaft 737. (The arm 862 for the earnings record feeler is journaled on the shaft 738, which, it will be recalled, is in axial alinement with the shaft 737.) This link 860 extends to the right and has a flange 863 normally engaging the periphery of a cam 864 (Fig. 91), which is secured to the printer drive shaft 370. Integral with the arm 862 is another arm 865 having a notch 866 for a purpose to be described later. The timing of the cam 864 is shown in space 6 of the time chart (Fig. 109), and, immediately after the beginning of the operation of the shaft 370 in a clockwise direction, the periphery of the cam 864 is moved away from the flange 863, at which time a spring 867, connected with the feeler 858, rocks the feeler clockwise, and, if there is no check in the machine, this feeler 858 will continue its clockwise movement under the action of the spring 867 until the upper end of the feeler enters a hole in the cabinet 146 and also a hole in the check guide 868. This movement of the feeler 858 will move the link 860 and the arms 862 and 865 from the positions shown in Fig. 90 to that shown in Fig. 91, wherein a pawl 875 will be drawn by its spring 876 into the notch 866 of the arm 865. This pawl 875 is pivoted on a lever 877, which in turn is pivoted on the shaft 737. The lever 877 carries a pin 878 engaged by a forked arm 879 carrying a roller 880 cooperating with a cam 881 (space 8 of the time chart, Fig. 109) secured to the printer shaft 370. This arm 879 is mounted on a rod 882 (the arm 879, Fig. 43—B, for the earnings record is mounted on a shaft 883, which is in axial alinement with the rod 882). As shown in Figs. 42—A and 42—B, the rod 882 is supported by the printer frames 132 to 134, and the shaft 883 is supported by the printer frames 135 and 136. A spring 884 tends at all times to hold the roller 880 against the surface of the cam 881.

Immediately after the link 860 has been moved from the position shown in Fig. 90 to that shown in Fig. 91, the cam 881, acting on the roller 880, rocks the arm 879 counter-clockwise, which rocks the lever 877 clockwise from the position shown in Fig. 90 to that shown in Fig. 92. This clockwise movement of the lever 877 causes the following to happen.

It will be remembered that the pawl 875 engaged the notch 866 of the arm 865 when the link 860 was moved to the left, due to the fact that there was no check 152 on the cabinet 146 beneath the

check guide 868. This movement of the pawl 875 is sufficient to position the upper end thereof beneath a shoulder 885 of a lever 886 pivoted on the shaft 737. This lever 886 has a slot 887, into which projects a roller 888 carried by a plate 889 having internal gear teeth meshing with a pinion 890 on the shaft 753.

From the above it can be clearly seen that, since the pawl 875 is beneath the shoulder 885 of the lever 886, this lever 886 will, as the lever 877 is rocked clockwise by the cam 881, be rocked likewise from the position shown in Fig. 90 to that shown in Fig. 92, wherein the slot 887, through its cooperation with the roller 888, will rock the plate 889 counter-clockwise to drive the shaft 753, which shaft, as above described, sets the proper notched plate in the groups of plates 801 to 829 to prevent the operation of any of the hammers 712 to 719, which are adapted to print in columns 12 to 19 on the check.

As the pawl 875 is moved upward by the clockwise movement of the lever 877, this pawl, still being in engagement with the notch 866, will rock the arm 865 and the integral arm 862 clockwise from the position shown in Fig. 91 to that shown in Fig. 90, which brings the feeler 858 counter-clockwise to its normal position, shown in Fig. 90. During this operation of the mechanism just described, the spring 884, being attached to the arm 879 and to the lever 886, has been put under tension, which tension will assist in restoring these parts to their normal positions as the cam 881 nears its normal position. This spring action is also made positive through the medium of a cam 892 secured to the printer shaft 370, which contacts a roller 893 on the lever 877 to rock this lever counter-clockwise to its normal position, which, through the pin 878, will positively rock the arm 879 clockwise to its normal position. The lever 877, as it is being restored to normal by its contact with a pin 894, will rock this lever 886 counter-clockwise to its normal position, whereupon the slot 887 will rock the plate 889 clockwise or back to the position shown in Fig. 90, which will turn the feeler shaft 753 and all of the control disks thereon back to their normal positions.

Since the actuation of this mechanism is very rapid, the lever 886 is provided with a stop finger 895 (Fig. 92), which normally rests against a hub of the cam 881. This lever 886 also has another stop shoulder 896 (Fig. 90), which contacts the same hub when the mechanism has been moved to its extreme position to shift or turn the shaft 753 when there is no check 152 in the machine.

From the above description it will be clear that, when the plate 889 (Fig. 90) is moved, due to the fact that there is no check in the machine, said plate 889 will, through the shaft 753, operate all of the plates on said shaft which are in the plate groups 812 to 819 inclusive to prevent the operation of all the hammers 712 to 719 inclusive when there is no check in the machine.

These control plates just referred to for the groups 812 and 814 are shown in spaces 13 and 14 of the control chart (Figs. 64—A and 64—B). The control plate in plate groups 815 to 819 inclusive are shown in spaces 8 to 12 inclusive of the control chart in Fig. 65, and the plate in group 813 is shown in Fig. 50.

When, however, there is a check in the machine, the feeler 858 moves only until it contacts the bottom of the check 152, whereupon the link 860 is moved only part way between the positions shown in Figs. 90 and 91, which is not far enough to position the notch 866 in front of the pawl 875, and therefore the pawl 875 is caused to ride upon a surface 899 of the arm 865 and is not permitted to fall beneath the shoulder 885 of the lever 886. Consequently, when the lever 877 is moved or operated by the cam 881 in the manner previously described, the arm 865 is not moved but is allowed to remain in the position shown in Fig. 90, due to the fact that the nose of the pawl 875 rides upon the surface 899 of the arm 865 in an idle manner until it picks up the arm 865 and restores it to its normal position, as shown in Fig. 90.

The summary feeler 857 (Figs. 39 and 68) controls all of the hammers 701 to 711 inclusive, to prevent operation of these hammers when there is no payroll summary 151 between the guide plates 898 (Figs. 68 and 70) to receive the printed data when a payroll check is issued.

The feeler 857 is controlled by a disk or plate 901 (Figs. 39, 57—A, and 68), which carries a roller 902 cooperating with the lever 886, which operates the summary feeler. This plate 901 drives the summary feeler shaft 754, and, as has been described previously, on this shaft is each of the plate groups 801 to 811, as shown in space 6 of the control chart in Fig. 65, and spaces 3 to 12 in Figs. 64—A and 64—B of the control chart, and, as has been described previously, these plates positively control all of the hammers 701 to 711 inclusive, to prevent operation of any one of them if there is no payroll summary 151 inserted between the guide plates 898 to receive the printed impression during the time a check is being printed upon.

In connection with the summary feeler mechanism, companion cams 903 and 904 (Fig. 46—A) operate the lever 877 and the arm 879 in the same manner that the cams 881 and 892 operate said lever and arm for the check, except that the timing is slightly different, as shown in space 7 of the time chart (Fig. 109).

The feeler 859 (Figs. 43—A and 43—B) for the earnings record controls all of the hammers 720 to 729 inclusive, to prevent the operation of any one of them when there is no earnings record 153 in the machine to receive the printed data when a check and summary are being printed upon. The feeler operating mechanism, as has been described in connection with the check (Figs. 90 and 92), cooperates with a control plate 906, which drives the shaft 752, which shaft, it will be recalled, has thereon, in each of the plate groups 820 to 829 inclusive, a control plate called for in spaces 16 to 24 of the control chart (Figs. 64—A and 64—B) and in space 13 of the control chart in Fig. 65, to control each of the hammers 720 to 729 inclusive when the feeler 859 finds no earnings record 153 between the earnings record guide plate 907 to receive printing.

The lever 877 and the arm 879 associated with the earnings record feeler are operated by companion cams 909 and 910 (Figs. 43—B and 46—B) and are timed exactly like the cams 903 and 904 for the summary, as shown in space 7 of the time chart (Fig. 109).

Machine locked under control of the check feeler, the summary feeler, and the earnings record feeler

The mechanism about to be described locks up the machine if there is no summary 151, check 152, or earnings record 153 in the machine, for a subsequent operation, to prevent a second oper-

ation of the machine when any one of said records has been omitted.

When the machine is put through an operation without any one of those printing mediums in the machine, as the machine locks to prevent a subsequent operation, the operator must release the machine lock by a special hand release mechanism, to be described hereinafter, and then make a correction operation, taking the amount out of the crossfooter, so that, when the check is finally issued, the employee's net pay will be the right amount.

If this correction operation were not made, the crossfooter would have double the amount of the regular hours earnings in it, and consequently the gross pay and the net pay would both be wrong.

To lock the machine to prevent a subsequent operation, as above mentioned, all that it is necessary to do is to prevent the clockwise movement of the release or key lock shaft 149. Referring to Figs. 33, 34 and 97, it will be recalled that, when the key lock shaft 149 is rocked clockwise, the shaft 628, through the link 626 and the arm 627, is given a clockwise movement at the same time. Secured to this shaft 628 is an arm 915 having pivoted thereto a link 916, which at its lower end is pivoted to a lock lever 917 journaled on the type shaft 665. The lever 917 has a right-angled finger 918 adapted to cooperate with the upper end of a lock arm 919 journaled on a shaft 920 supported by the printer frames 135 and 136, as shown in Fig. 42—B. A spring 921 pulls a finger 922 of the arm 919 underneath a latch 923 of an arm 924 fast on a shaft 925 supported by the left printer frame 131 and a bracket 926 carried by the tie bar 138. A spring 927 holds the latch 923 on top of the finger 922 of the lock arm 919.

It will be recalled that, when the key lock shaft 149 is rocked clockwise, the shaft 628 is rocked clockwise, thus raising the link 916, which rocks the lever 917 clockwise, and, when the parts are in the positions shown in Fig. 97, such movement of the lever 917 may be made. However, if there is no summary 151 or check 152 or earnings record 153 in the machine, the lock arm 919, by means to be described hereinafter, is released from the latch 923 by the clockwise movement of the shaft 925, whereupon the spring 921 moves the arm 919 beneath the finger 918 of the lever 917, thus preventing any movement of the shaft 628 and the key lock shaft 149, consequently locking the machine against operation.

The above clockwise movement of the lock arm 919 by its spring 921 is limited by a finger 928 of the arm 919 contacting a stud 929 on a release slide 930 supported on the shaft 920 and a stud 931 carried by the printer frame 135 and held in contact with the stud 931, as shown in Fig. 97, by a spring 932.

When the machine is locked up for a subsequent operation, as above mentioned, by the moving of the arm 919 underneath the finger 918, it is necessary for the operator to release this lock so that the said subsequent operation may be performed to correct the crossfooter as above mentioned. This release is occasioned by a movement of the release slide 930 by the operator to the right, as viewed in Fig. 97, whereupon the stud 929, through its contact with the finger 928, rocks the arm 919 counter-clockwise, and the finger 922 will contact the front upper part of the latch 923 and cam the latch arm 924 clockwise against the action of its spring 927 until the finger 922 is below the latch 923, after which the spring 927 will rock the arm 924 counter-clockwise to lock the lock arm 919 in the position shown in Fig. 97.

The shaft 925 is adapted to be rocked clockwise to release the latch 923 from the lock arm 919 under control of the summary feeler 857, the check feeler 858, the earnings record feeler 859, and their associated control plate groups, the first of which group 935 (Fig. 57—B), shown in space 15 of the control chart (Figs. 64—A and 64—B), will be described. There are four plates in this group, the first of which is controlled by the printer control lever 789, the second by the feeler 858, plate 3 by the differential of row 2, and plate 4 by the differential of row 1. This control chart shows that plate No. 1 has a notch in the zero position of the lever 789, which is the payroll writing position of the lever. Plate No. 2 has a notch cut in the Roman I position, which plate is controlled by the check feeler and which, it will be recalled, is given a slight movement by the check operating mechanism of Figs. 90, 91, and 92, which turns the plate No. 2 to bring this notch in the Roman I position into alinement with the Arabic zero position. Plate No. 3, which is controlled by the row 2 differential, has a notch in the 1 position on the Arabic side, because this differential is stopped in the 1 position when the Prior earnings key is depressed, which is the first operation involved in the writing of a payroll check and during which operation, it will be recalled, the consecutive number is printed upon both the check and the summary, and plate No. 4 has a notch in the zero Arabic position, which is the add position of the total row differential, which is row 1. Therefore, if there is no check in the machine, a feeler arm 936 and its feeler block 767 will be permitted to rock counter-clockwise (Fig. 97) under the influence of a spring 937, which is attached to an arm 938 rigidly secured to the arm 936. Pivoted to the arm 938 is a link 939, which is also pivoted to an arm 940 fast on the shaft 925.

When the shaft 762 is rocked counter-clockwise in the manner previously described and the arm 765 (Fig. 57—B) moves with it, the spring 937 will then be permitted to rock the arms 938 and 936, whereupon the lower fingers of the arm 936 and of the feeler block 767 will enter notches in all of the plates of the plate group 935 when there is no check in the machine, consequently moving the link 939 to the right and rocking the shaft 925 clockwise to release its latch 923 from the finger 922 of the lock arm 919, thus locking the machine so that a subsequent operation cannot be performed without putting a check into the machine.

In other words, the lever 789 must be in the check writing position, the check feeler 858 must be operated and find no check, the Prior earnings key 164 must have been depressed and the row 2 differential stopped in the 1 position, and, of course, the row 1 differential must be in the add position, which is zero, as indicated in space 15 of the control chart. It is only when all of these conditions prevail that the lock arm 919 will be operated to lock the machine.

The shaft 925 (Figs. 39 and 97) is also adapted to be moved to position the lock arm 919 beneath the finger 918, if there is no earnings record 153 in the machine, which control is under the control of a plate group 945 (Fig. 39), which is charted and shown in space 1 of the chart in Figs. 64—A and 64—B. Plate 1 of this group has a notch in the Roman I position, so that, when

the plate 906 (Fig. 43—B) is rocked, plate 1 of this group 945 will be rocked through the shaft to present the notch in the Roman I position to the feeler finger. Plate No. 2 is controlled by the differential of row 4, and therefore it has notches in the 5, 6, 7, and 8 Arabic positions, which correspond to the Earnings keys 166, X, S, T, and R, respectively. Plate No. 3 is controlled by the differential of row 2, which has a notch in the 9 position (automatic position to select the crossfooter), and plate No. 4 is controlled by row 1, which has a notch in the Arabic zero or add position. Thus, if any of the keys X, S, T, or R is depressed to set up the amount, the differential of row 4 will be stopped in a corresponding position and the differential of row 2 will be automatically stopped in the 9 position, as described previously, and the differential of row 1 will be stopped in the zero or add position, and, if there is no earnings record in the machine, all four of the notches will line up with the lower feeler finger of a feeler lever 946 (Fig. 39), which is identical with the feeler arm 936 of Fig. 97. Rigidly secured to this feeler lever 946 is an arm 948 having a spring, not shown but like the spring 937 attached thereto. Pivoted to this arm 948 is a link 949, which is pivoted to an arm 950 secured to the shaft 925. From the above it can be seen that, when the notches of all of the control plates in group 945 aline with the lower finger of the regular feeler block 767 and the finger on the lever 946, the spring, like the spring 937, will rock the arm 948 and cause the link 939, through the arm 950, to rock the shaft 925 clockwise to release the lock arm 919 to the action of the spring 921 so that the arm will be positioned beneath the finger 918 to prevent release or movement of the key lock shaft 149 if there is no earnings record in the machine when a payroll check is being printed by the machine.

When there is no payroll summary 151 in the machine, the lock arm 919 is adapted to be moved under the finger 918 by movement of the shaft 925 under control of a single control plate 955 (Figs. 39 and 98), which has a notch in the Roman I position, so that, when the shaft 754, by which the plate 955 is driven by the plate 981 (Fig. 68), the notch will be moved opposite a finger on a feeler lever 956, which is drawn into this notch by a spring 957 connected to an arm 958 rigidly secured to the lever 956 when the regular arm 765, secured to the shaft 762, permits such movement upon the counter-clockwise movement of the shaft 762, as has been previously described. As the lever 956 moves counter-clockwise (Fig. 98), a link 959, pivoted to the arm 958 and connected to an arm 960 fast on the shaft 925, rocks the arm 960 and the shaft 925 clockwise to release the latch 923 from the finger 922 of the lock arm 919, and thus its upper end will be positioned beneath the finger 918 to prevent release of the machine if there is no payroll summary 151 in the machine to receive the print during the time a check is being printed.

Check feeding mechanism

The payroll check 152 is adapted to be inserted into the machine to receive the data in connection with an employee's pay betwen the side arms of a check guide 961 (Fig. 1) and underneath a deflector 962 (Fig. 71) up against a stop 963 to the position shown in Fig. 71. This places the check on top of the bottom one of the check guides 868 and beneath the type wheels associated with the hammers 712 to 719 (Fig. 58—B). This brings the rear edge of the check on top of a pair of feed rollers 964 and beneath a pair of tension rollers 965, which are adapted to be moved into contact with the check, so that, when the feed rollers 964 are turned, the check will be fed to the various positions indicated in Fig. 71. From the inserted position, the check first receives an initial movement to the position so designated. It is then fed backward to the first print position to have the hours and earnings printed thereon, after which it is fed one step forward for the overtime hours and overtime earnings for the second print. The next feed is to the third print position to receive the print of the gross amount of the employee's pay. If the employee has other special earnings, such as premiums or bonuses, the check would be advanced one step to the right of the second print position for the premium and another step to the right for the bonuses before the gross amount is printed on the check. However, in Fig. 71, the next movement after the printing of the gross amount is backward to the fourth print position, which is for the first deduction. The deductions are now printed by successive operations of the machine, and each time the check 152 is fed forward one step until it finally reaches the eighth print position, which, as shown in Fig. 71, is for the fifth deduction. (The number of deductions may vary from one to any number which may be allowed by the company where the employee is employed, so that, instead of having five deductions as shown, there may be one or there may be seven or eight deductions.) After the last deduction, the check 152 is fed (in the illustrated form in Fig. 71) to the ninth print or net pay position, which, as shown here, is a backward movement to this net pay position.

The means for feeding the check from the hand-inserted position, shown in Fig. 71, until it finally reaches its net pay position will now be described.

The feed rollers 964 are secured to a shaft 966, which is supported by a boss 967 (Fig. 42—A) on the side of the printer frame 133 and by the printer frame 134 (Fig. 42—B).

The tension rollers 965 (Figs. 67 and 103) are carried by a pair of arms 968 yoked together and journaled on a shaft 969 carried by brackets 970 secured to the base 123. Secured to the shaft 969, adjacent each of the yoke arms 968, is an arm 971 having a finger 972, against which a pin 973 on the arm 968 is held by a torsion spring 974.

In Fig. 67, the tension rollers 965 are shown in their normal positions, disengaged from the feed rollers 964. When the shaft 969 is rocked counter-clockwise, the rollers 965 are moved downwardly into the positions shown in Figs. 87, 88, and 103, to grip the check 152 so that, when the feed rollers 964 are rotated by means to be described hereinafter, the check 152 will be fed to the various print positions numbered 1 to 9 in Fig. 71 to receive the proper data in connection with an employee's earnings. To move the tension rollers 965 from the normal position shown in Fig. 66 to the gripping position shown in Fig. 103, a cam 975, secured to a sleeve 976, which is driven, by means to be described hereinafter, by the printer cam shaft 370, contacts a roller 977 on a bell crank 978 and rocks the bell crank clockwise. This bell crank is pivoted on a stud 979 in the printer frame 134 and is pivoted to a link

980 having a pin 981 engaged by an arm 982 secured to the tension operating shaft 969, and consequently, when the bell crank 978 is rocked clockwise from the position shown in Fig. 66 to that shown in Fig. 103, the arm 982 and the shaft 969 are rocked counter-clockwise to move the tension rollers 965 into engagement with the check, which has been placed on top of the feed rollers 964. The bell crank 978 has a flattened pin 983, which is engaged by a latch 984 secured to a short shaft 985 carried by the printer frame 134 to hold the tension rollers 965 in feeding engagement until they are released by the check ejecting mechanism to be described hereinafter.

At the time the tension rollers 965 are moved into the position shown in Fig. 103, the stop 963 is brought down out of the path of the check, so that it may be fed by the rollers 964 and 965. The stop is secured to an arm 986 secured to a shaft 987 carried by the printer frames 133, 134, and 135 (Figs. 42–A and 42–B). Also secured to the shaft 987 is a crank 988 held in the position shown in Fig. 66 against a pin 989 by a spring 990. When the link 980 is moved from the position shown in Fig. 66 to that shown in Fig. 103, the pin 989 rocks the crank 988 and the shaft 987 clockwise, thus rocking the arm 986 and moving the stop 963 below the line of travel of the check 152.

Just before the check is to be ejected by the means to be described hereinafter, the latch 984 is rocked counter-clockwise to release it from the pin 983, whereupon the spring 990 will move the link 980 to the left, as viewed in Fig. 103, to raise the tension rollers 965 off the feed rollers 964, so that the check can be ejected at the proper time.

At the same time, the spring 990 rocks the crank 988 and the arm 986 counter-clockwise to position the stop 963 up into the path of the check 152, which is to be inserted by hand, to stop it in the proper position.

The feeding of the check 152 from the hand-inserted position shown in Fig. 71 to the initial movement position is accomplished by mechanism shown in Figs. 67, 83, 86, and 87, which will now be described.

Secured to the shaft 966 is a gear 991 adapted to be driven by a rack 992 slidably mounted on a stud 993 carried by the frame 134 and guided near its right end between studs 994 also carried by the frame 134. Secured to the sleeve 976, which, it will be remembered, is driven by the shaft 370, is a cam 995 cooperating with a roller 997 on an arm 996 pivoted on a stud 998 carried by the frame 134. A spring 999 normally holds the roller 997 against the cam 995. The arm 996 engages a stud 1000 on a bar 1001 mounted to slide on the stud 993 and between the studs 994. Pivoted to this bar 1001 is a pawl 1002 adapted to cooperate with a block 1003 carried by the rack 992. When the cam 995 operates the arm 996, the pawl 1002, by its cooperation with the block 1003, moves the rack 992 from the position shown in Fig. 86 to that shown in Fig. 87, whereupon the check 152 is moved from the hand-inserted position to the initial movement position shown in Fig. 71.

Secured to the rack 992 to move therewith is a bar 1004 having a shoulder 1005 adapted to cooperate with a pawl 1006 pivotally mounted on a bar 1007, which slides on the stud 993 and between the studs 994. This bar 1007 is adapted to be driven toward the left from the position shown in Fig. 88 by a cam 1008 through an arm 1009 at the same time the rack 992 is driven to the left by the cam 995. The cam 1008 is secured to the sleeve 976. After the bar 1007 begins to move toward the left (Fig. 88), the pawl 1006 is rocked clockwise by a spring 1010, to position it in the path of the shoulder 1005 on the bar 1004, so that, as the cam 995 permits a spring 1011 to draw the rack 992 toward the right, the pawl 1006 will be in the path of the shoulder 1005 and stop the rack 992 when the shoulder 1005 contacts the pawl 1006, at which time the check 152 will have been moved backward to the hours and earnings or first print position, as shown in Fig. 71. However, the bar 1001 will be returned fully to the position shown in Fig. 86, thus leaving a wider gap between the pawl 1002 and the block 1003 on the rack 992. However, the bar 1007 will not go back to the position shown in Fig. 88, and consequently there will be a gap between the cam 1008 and the roller on the arm 1009 at the end of this particular operation, as clearly shown in Fig. 83.

The bar 1007 is held in the position shown in Figs. 83 and 85, which is the first print position for the check 152, by means of a pawl 1012 engaging a shoulder 1013 on the bottom side of the bar 1007. The pawl 1012 is pivoted on a stud 1014 carried by the frame 134 and is normally urged clockwise by a spring 1015 to hold the point of the pawl 1012 against the bottom surface of the bar 1007, so that, as the bar 1007 is moved to the left, as described above, the point of the pawl 1012 will engage to the right of the shoulder 1013 when the bar 1007 has been moved to the position shown in Fig. 85.

The pawl 1002 is normally urged clockwise by a spring 1016 (Fig. 86) until the stud to which the spring is attached contacts the bottom surface of the bar 1001. The pawl 1002 also carries a pin 1017 normally contacting the top surface of an arm 1018 pivoted on a stud 1019, which is also carried by the frame 134, to prevent the arm 1018 from being rocked counter-clockwise by a spring 1020. The pawl 1006 carries a pin 1021 normally contacting a surface 1022 on the bottom of the arm 1018, but, as the pawl 1006 is moved to the left by the bar 1007, the spring 1010 rocks the pawl 1006 clockwise when the pin 1021 passes off the surface 1022 up into a relieved portion 1023 of the arm 1018, so that the pawl 1006 may be placed in the path of movement of the shoulder 1005 on the bar 1004. The spring 1020 holds a finger 1024, on the arm 1018, normally in contact with a pin 1025 on an arm 1026 also pivoted on the stud 1019. A spring 1027 holds the arm 1026 against a pin 1028 carried by the frame 133, and consequently the lever 1018 is held normally in the position shown in Fig. 67.

It will be remembered that the pawl 1006, through its pin 1021 engaging the lower surface 1022 of the arm 1018, holds the pawl out of the path of the shoulder 1005 on the bar 1004.

To prevent the pawl 1002 from driving the rack 992 and thus operating the feed rollers 964 during all operations following the initial movement operation, when the bar 1001 is moved back to the right, to the position shown in Fig. 83, the pawl 1002 and its pin 1017 are in the position shown in this figure. Prior to this time, however, the bar 1007, it will be recalled, is moved to the left from the position shown in Fig. 88 to the position shown in Fig. 83, and, when this occurs, a cam surface 1029 on the bar 1007, through its contact with a stud 1030 on the arm 1026, rocks the arm 1026 counter-clockwise, whereupon the spring 1026 rocks the arm 1018

from the position shown in Fig. 87 to the dot-and-dash line position shown in Fig. 83, and consequently, when the cam 995 moves the bar 1001 to the left, which it does during each of the several operations which are required to print all of the various data on the check 152, as shown in Fig. 71, the pin 1017 on the pawl 1002 will strike the camming surface 1031 on the arm 1018 and rock the pawl counter-clockwise so that it will be moved out of the path of the block 1003 on the rack 992. Consequently the rack 992 will not be moved during the several operations of the cam 995 during the printing of certain data on the check 152.

The camming of the arm 1026 takes place before the bar 1001 reaches its returned right-hand position, as shown in Fig. 83, and, during the time this bar is traveling, the pin 1017, of course, rides along the top surface of the arm 1018, and the spring 1020 is merely stretched. However, as soon as the pin 1017 passes the right end of the lever, then the spring 1020 can do its work and move the arm 1018 up into the dot-and-dash line position shown in Fig. 83.

It will be remembered that, during this movement of the bar 1001 to the right and the rack 992 back to the position shown in Fig. 87, where the shoulder 1005 on the bar 1004 contacts the pawl 1006, it leaves the check 152 in first print position (Fig. 71). Now the hours and earnings are printed on the first line of the check in column 12 thereof. The next two operations, to feed the check 152 to the second print position and the third print position, are effected by the pawl 1006 in cooperation with a series of teeth 1032 on the bar 1004 in a manner now to be described.

It will be recalled that the bar 1007 is stopped in the position shown in Fig. 85 by the pawl 1012 engaging the shoulder 1013 when the check 152 has been fed backward from the initial movement position to the first print position. From hereon to the various second and third print positions, the feeding is controlled by a group of selecting plates, one of which is shown in Fig. 85 and which are designated in space 3 of the control chart (Fig. 65) and are numbered plate group 1040. These plates are also shown in Fig. 57—B. There are only two plates in this group, plate No. 1 being omitted. Plate No. 2 is controlled by the row 2 differential, and plate No. 3 is controlled by the row 1 differential.

It will be recalled that the plate No. 2, according to the control chart in space 3 of Fig. 65, and also as shown in Fig. 85, has notches in the Roman 0, V, VI, VIII, and IX positions. This means that, whenever the differential of row 2 stops in any one of those positions, the notch will be presented to the upper feeler of the feeler block 767, which is carried by a feeler lever 1041 pivoted on the shaft 762 and having a spring 1042 connected thereto normally urging the lever 1041 in a counter-clockwise direction. The plate No. 3 of this plate group 1040 has a notch in the Roman 0 position, which is the add position for the differential in row 1. Therefore, in adding operations, whenever the row 2 differential stops in any of the positions designated in space 3, the lever 1041 can be rocked counter-clockwise because the upper finger of the feeler block 767 will find notches and thus permit such counter-clockwise rocking of the lever 1041 by the spring 1042. Pivoted to the lever 1041 is a link 1043 forked at its lower end to engage a stud 1044 carried by the pawl 1012. Therefore, the counter-clockwise movement of the lever 1041 will rock the pawl 1012 counter-clockwise and disengage its nose from the shoulder 1013 on the bar 1007, whereupon a spring 1045, connected to the operating arm 1009 (Fig. 101) will move the bar 1007 toward the right from the position shown in Fig. 85 until it is stopped by the nose of a pawl 1046 (Figs. 85 and 102) contacting a shoulder 1047 of the bar 1007.

Now, when the bar 1007 is in this position, the nose of the pawl 1006 is in engagement with the left-hand one of the teeth 1032 on the bar 1004, so that, when the cam 1008 rotates during the cycle of operation in which the first print occurs, the cam moves the bar 1007 to the left and the pawl 1006 drives the bar 1004 and the rack 992 one step, to turn the feed rollers 964 clockwise to feed the check 152 from the first print position to the second print position.

This same movement of the parts occurs during the operation of the printing of the overtime hours and overtime earnings, which is the second print, thus feeding the check 152 to the third print position so that the gross pay can be printed during the operation designated as third print.

As the check 152 is fed up to the second print position, the rack 992 is retained in that second print position by the nose of a pawl 1048 pivoted on the stud 1014 engaging retaining teeth 1049 in the bottom of the rack 992. A spring 1050 holds the nose of the pawl 1048 against the teeth 1049 on the rack 992. It might be well to state here that the pawl 1046 is rigidly secured to the pawl 1048, as shown in Fig. 102.

The timing for permitting the counter-clockwise movement of the lever 1041 (Fig. 85) under the influence of its spring 1042 is controlled by companion cams 1051 and 1052 (Fig. 84, and shown in space 15 of the time chart, Fig. 109), which cooperate with a bell crank 1053 journaled on the shaft 737. Secured to the bell crank 1053 is an arm 1054 carrying a stud engaged by a forked arm 1055, which is secured to a shaft 1056 carried by the printer frames 131 to 134 inclusive, shown in Figs. 42—A and 42—B. Also secured to this shaft 1056 is an arm 1057 having a pin 1058 cooperating with a lever 1059 pivoted on a stud 1060 mounted on the printer frame 134. A link 1061 connects the lever 1059 with the lever 1041.

During the time the cam 995 allows the check 152 to be backed up from the initial position, shown in Fig. 71, to the first print position, the cams 1051 and 1052 function to allow the feeler lever 1041 to be rocked counter-clockwise to feel for the notches in the plate group 1040 by rocking the bell crank 1053 and the arm 1054 clockwise, which, through the arm 1055, rocks the shaft 1056 and the arm 1057 counter-clockwise, whereupon the pin 1058 is moved away from the lower part of the lever 1059, thus allowing the spring 1042 to rock the lever 1041 counter-clockwise to feel for the notches in the plate group 1040 to control the pawl 1012 in the manner previously described.

After the first print is made, the cams 1051 and 1052 function again during this first print operation, to allow the feeler lever 1041 to function to lower the pawl 1012 so that the bar 1007 may be moved to the right to bring the pawl 1006 into cooperation with the left-hand one of the teeth 1032, so that the check may be fed to the second print position by the pawl 1006 upon operation of the cam 1008.

After the second print, the same thing happens

again, and the check 152 is fed to the third print position so that the gross may be printed.

After the gross is printed, it will be noted in Fig. 71 that the check 152 is backed up to the first deduction or fourth print position. The means for backing the check up to the fourth print position for first line deduction will now be described.

This mechanism is shown particularly in Fig. 100 and is controlled by notched plates under control of the row 1 and row 2 differentials. These plates have been given plate group number 1065 and are shown in the control chart in space 2, Fig. 65, in Fig. 100, and also in Fig. 57—A.

Companion cams 1066 and 1067, which are shown in space 18 of the time chart, cooperate with a bell crank 1068 pivoted on the shaft 737. This bell crank is connected by a link 1069 to a lever 1070 pivoted at 1071 on a feeler lever 1072 pivoted on the shaft 762 and having a spring 1073 tending to rock the lever counter-clockwise. The lever 1072 has the regular feeler block 767 secured thereto, to cooperate with the plate group 1065. As shown in space 2 of Fig. 65, the plate No. 2 has notches in the 0 to the 8 positions, leaving a high spot in the No. 9 Arabic position only. On the Roman positions, all high spots are cut off. In connection with this particular plate group, it is the high points that control rather than the notches, and consequently, when the row 2 differential goes to the 9 position and finds a high spot, the lever 1072 (Fig. 100) will not be rocked counter-clockwise when the cams 1066 and 1067 are operated because the lower finger of the feeler block 767 will contact a high spot in the ninth position of plate No. 2, which is the position where the row 2 differential stops automatically when the Gross key 162 is operated to select the plus side of the crossfooter to print the employee's gross pay on the check. The Gross key in row 1 being in the third position, the plate No. 3 has notches in all positions except this 3 position, as shown by the chart, and consequently this plate also will be contacted by the lower feeler of the block 767 in the third position, which again prevents movement of the lever 1072 counter-clockwise. Since the lever 1072 cannot move counter-clockwise, the lever 1070 will pivot around the pivot pin 1071 and, by its engagement with a stud 1074 on an arm 1075 journaled on the rod 744, will rock this arm 1075 counter-clockwise, which, through a pin 1076, will rock an arm 1077 and a shaft 1078, to which it is fastened, in a clockwise direction. Also fast to the shaft 1078 is an arm 1079 having a pin 1080 engaged by a slide 1081, which slides on the stud 993 and a stud 1082 (Fig. 89) carried by the bar 1007. This clockwise movement of the arm 1079 moves the slide 1081 to the right (Fig. 89), whereupon a finger 1083 thereof, by its contact with a roller 1084 carried by the pawl 1048, rocks said pawl 1048 counter-clockwise to disengage its nose from the teeth 1049 on the rack 992. At the same time, another finger 1085 on the slide 1081 contacts a pin 1086 on the pawl 1006 and rocks said pawl counter-clockwise and disengages it from the bar 1004, at which time, since both pawls 1006 and 1048 are disengaged from the bar 1004 and the teeth 1049, the spring 1011 moves the rack from wherever it is sitting to the right until its right-hand end contacts an arm 1087 secured to the shaft 1056. This arm 1087 has a finger 1088 held in contact with a stud 1089 on the frame 134 by a spring 1090.

During the first part of the operation which prints the first deduction, the bar 1007, when it is moved to the left, will cause the pawl 1006 to engage the shoulder 1005 on the bar 1004 and move it slightly to the left, which will cause the rack 992 to be moved slightly to the left to positively aline the check 152 in the first deduction or fourth print position, which is exactly the same position that it occupied for the first print when the hours and earnings were printed.

After the printing of the first deduction, the check 152 again gets successive feeds by means of the pawl 1006 and the bar 1004 to print the second, third, fourth, and fifth deductions by moving the check 152 to the fifth, sixth, seventh, and eighth print positions, as shown in Fig. 71.

After the printing of the last deduction, the operator is then ready to strike the Net pay key 162 to print the net pay of the employee on the check, which will, as has been previously described, be the difference between his gross pay and the deductions. The net pay, as shown in Fig. 24, which shows a facsimile of the check, is always printed in the same position on the check, which happens to be opposite the fourth deduction, which has been designated the ninth print position in Fig. 71, and it can be seen that the check is in alinement with the fourth deduction or seventh print position.

The means for feeding the check to this ninth print or net pay position will now be described, with particular reference to Figs. 65, 95, and 96.

The feed of the check 152 to the ninth print or net pay position is also under the control of selecting plates which have been numbered plate group No. 1095. These are shown in Fig. 57—A, in space 7 of the control chart (Fig. 65), and partly in Fig. 95. Secured to the feed shaft 966 is a gear 1096 (Fig. 95), which is adapted to be driven by a rack 1097 slidably mounted on a stud 1098 at its left end and between studs 1099, all of which are carried by the printer frame 133. Mounted adjacent the rack 1097 on the stud 1098 and between the studs 1099 is a bar 1100 having a stud 1101 engaged by an arm 1102 pivoted on a stud 1103 carried by the printer frame 133. The arm 1102 has a roller 1104 held by a spring 1105 in contact with a cam 1106, which is secured to the printer drive shaft 370. The bar 1100 carries a pivoted pawl 1107 having a stud 1108 held by a spring 1109 in contact with a foot 1110 of an arm 1111 secured to a hub 1112, which in turn has fastened to it a feeler lever 1113, which carries the regular feeler block 767 and has attached thereto a spring 1114 tending to rock the lever 1113 and the arm 1111 in a counter-clockwise direction. The lever 1113 is held in contact with a stud 1115 on an arm 1116, which is secured to the shaft 762, which, it will be recalled, is given a counter-clockwise movement and then a return clockwise movement to normal position once during each operation of the machine.

When this shaft 762 is rocked counter-clockwise, the arm 1116 is rocked and moves the stud 1115 away from the lever 1113, whereupon the spring 1114 will rock the feeler lever 1113 counter-clockwise, and the lower fingers of the lever and of the block 767, if they find notches in all of the plates of the plate group 1095, will be rocked far enough to raise the arm 1111, whereupon the spring 1109 will rock the pawl 1107 clockwise,

placing its left end in the path of a shoulder 1117 on the rack 1097.

By referring to Fig. 65 and space 7 thereof, it will be noted that plate No. 1, which is controlled by the check feeler, has a notch in the zero Arabic position, which is opposite the lower finger of the lever 1113. The plate No. 2 has a notch in the ninth Arabic position, and, since this plate is controlled by the row 2 differential, which during this Net pay operation is moved to its ninth position, the lower finger of the block 767 will be opposite the notch in this plate No. 2. The plate No. 3 has a notch in the 1 position, which is the Net pay position of row 1, and consequently the feeler block 767 and the feeler lever 1113 will find notches, thus permitting the spring 1114 to raise the arm 1111, whereupon the pawl 1107 will be moved into the path of the shoulder 1117 on the rack 1097. After this happens, the cam 1106 rocks the arm 1102 and moves the bar 1100 to the left, whereupon the pawl 1107 will pick up the shoulder 1117 and move the rack 1097 to the Net pay or ninth print position, as shown in Fig. 71. This is assuming, of course, that the rack 1097 is sitting in the position shown in Fig. 96. However, this rack may be in a position a considerable amount to the left of that shown in Fig. 96, and, if such is the case, then the pawl 1107 will simply move idly to the left upon movement of the bar 1100, and, when the rack 992 is released to the action of its spring 1011, a spring 1118, secured to the rack 1097, will move the rack 1097 along with the rack 992, and, since they are geared together through their gears 1096 and 991, they will always assume the same position, and, if the rack 1097 is being moved to the right by its spring 1118, it will move until the shoulder 1117 contacts the pawl 1107, which is being moved toward the left by the cam 1106 to a definite position, which definite position is the Net pay or ninth print position, as shown in Fig. 71.

The means for operating or driving the tension roll cam 975, the check feed cam 995, the check feed cam 1008, and a check ejector cam 1119, all of which are secured to the sleeve 976 (Figs. 46—B and 94), will now be described.

The sleeve 976, as previously stated, is journalled on the printer drive shaft 370. Secured to this sleeve 976 is another sleeve 1120 having an integral shoulder 1121. Secured to the printer drive shaft adjacent the shoulder 1121 of the sleeve 1120 is a plate 1122 (Figs. 93 and 94) carrying a driving pawl 1123 held by a spring 1124 in contact with the shoulder 1121, and consequently, when the shaft 370 is rotated clockwise, as long as the pawl 1123 is in engagement with the shoulder 1121, all of the cams 975, 995, 1008, and 1119 will be driven along with the shaft 370. A retaining pawl 1125 prevents any retrograde movement of the shoulder 1121 and cams.

Referring to Figs. 90 and 91, it will be recalled that, whenever there is no check 152 in the machine, the feeler 858 will cause the lever 886 to be rocked clockwise, and, when this occurs, a stud 1126 thereon will rock an arm 1127 counter-clockwise, as viewed in Fig. 91. This arm 1127 is secured to the rod 882, which also has secured thereto an arm 1128, which, when the rod 882 is moved counter-clockwise, is placed in the path of a tail 1129 on the pawl 1123. Consequently, when the plate 1122 is driven clockwise by the shaft 370 when the tail 1129 of the pawl 1123 contacts the arm 1128, said pawl will be disengaged from the shoulder 1121 of the sleeve 1120, and consequently this sleeve 1120 will not be driven with the shaft 370 during operations of the machine in which there is no check 152 present to receive printing, and consequently none of the cams 975, 995, 1008, or 1119 will be operated during such operations.

Check ejector mechanism

After the net pay has been printed on the check 152, the check is ejected and inverted during the ejection operation, so that the checks will be stacked in their proper numerical order. The stack of checks rests on a shelf 1130 (Fig. 1) near the center part of the machine underneath the check guide 961.

This check ejector mechanism is shown in Figs. 66, 67, 79 to 82, and 104. With the deflector 962 in the normal position, shown in Figs. 67 and 71, and also 79, the operator inserts the check 152 up against the stop 963, as shown. This insertion, of course, is made underneath the deflector 962. After this insertion, the feed rollers 964 are rotated to feed the check 152 to receive the several prints as indicated in Fig. 71, by the means which has been described previously. During the printing of the last two or three deductions, the check 152 will be fed into the position shown in Fig. 82, the deflector 962 having been moved from the position shown in Fig. 79 down to the position shown in Fig. 82 prior to this time, and then, after the operation of the Net pay key and during the time the net pay is printed, or immediately thereafter, the check 152 still remains in substantially the position shown in Fig. 82, where it is then ready to be ejected from the machine by the ejecting mechanism and at the same time automatically inverted so as to maintain the proper sequential numerical or alphabetical order of the checks as they are stacked on the shelf 1130.

The deflector 962 is secured to a shaft 1132, which is carried by the check guide 961. Also fastened to the shaft 1132 is an arm 1133 carrying a pin engaged by an arm 1134, which is pivoted on a shaft 1135 carried by brackets 1136 secured to the tie bar 138. The arm 1134 has a finger 1137 held in contact with a stud 1138 on a lever 1145 by a spring 1139 stretched between a stud on the arm 1134 and the stud 1138.

The lever 1145 is also pivotally mounted upon the shaft 1135 and has a finger 1140 normally held in contact with a stud 1141 on the frame 134 by a spring 1142. Secured to the shaft 1135 is an operating arm 1143, shown in the normal position in Fig. 80.

The shaft 1135 is adapted, by means to be described hereinafter, to be given first a clockwise movement and then a counter-clockwise movement back to its normal position. Upon the clockwise movement of the shaft 1135, the arm 1143 engages a stud 1144 carried by the lever 1145 and rocks said lever clockwise, whereupon the spring 1139 causes the finger 1137 to remain in contact with the stud 1138 of the lever 1145 and consequently rocks the arm 1134 clockwise, thus rocking the arm 1133 and the deflector 962 counter-clockwise from the position shown in Figs. 79 and 80 to that shown in Fig. 82.

The means for rocking the shaft 1135 and holding it will now be described. Secured to the shaft 1135 is a pinion 1150 (Figs. 66, 79, and 104) meshing with a rack 1151 slidably supported on a stud 1152 carried by the frame 134 and the shaft 737. This rack 1151 has a spring 1153 at-

tached thereto, normally urging the rack toward the right, as viewed in Fig. 79. The rack 1151 carries a small rack 1154 meshing with a pinion 1155 journaled on the shaft 737. Secured to the pinion 1155 is a smaller pinion 1156 meshing with a gear segment 1157 pivoted on a stud 1158 carried by the printer frames 134 and 135. Secured to the segment 1157 is an arm 1159 carrying a roller 1160 cooperating with the previously mentioned cam 1119, which, it will be remembered, is fast to the sleeve 976 and is driven through the clutch drive mechanism shown in Figs. 93 and 94.

To assist in holding the segment 1157 in the normal position shown in Fig. 79, the segment has an integral arm 1161 engaged by a pin 1162 on a spring-drawn arm 1163 pivoted on a stud 1164 carried by the frame 133. This arm 1163 lies between the cam 975 and the cam 1119 and is adapted to be actuated by a roller 1165 supported by the cams 975 and 1119.

The timing for the cam 1119 is shown in space 16 of the time chart (Fig. 109) and shows that the deflector is closed, beginning at 60 degrees and ending at 160 degrees, which occurs during the initial movement operation of the check indicated in Fig. 71. At this time, the cam 1119, through the arm 1159, the segment 1157, the rack 1154, and the gears 1155 and 1156, moves the rack 1151 from the position shown in Fig. 79 toward the left until a notch 1166 of the rack 1151 is positioned beneath a block 1167 on a crank arm 1168 (Fig. 66) pivoted on the stud 979. This crank arm 1168 is forked to engage a stud 1169 on the previously described tension roll retaining latch 984.

When this latch 984 is moved from the position shown in Fig. 66 to that shown in Fig. 103, it rocks the arm 1168 counter-clockwise after the notch 1166 has been moved beneath the block 1167, and consequently this block will then enter the notch 1166 and retain the rack 1151 in its left-hand position, thus holding the spring 1153 under tension. This position of the rack 1151 is maintained, as above mentioned, until it is time to eject the check during the net pay operation.

The high part of the cam 1119 causes a slight clearance between the left edge of the block 1167 and the left side of the notch 1166, so that, when it is time for the latch 984 to be released from the pin 983, which is occasioned by means to be described hereinafter, under control of a group of control plates, such mechanism will not have to overcome the full power of the stretched spring 1153.

When this release of the latch 984 from the pin 983 occurs, the arm 1168 will be rocked clockwise, and consequently the rack 1151 will be released to the action of the tension spring 1153, which will very rapidly draw the rack 1151 to the right, to rapidly rotate the shaft 1135 through the pinion 1150 in a counter-clockwise direction to eject and invert the check 152, which has been placed in the position shown in Fig. 82.

During the ejecting movement, in order to permit the feed bar 1004 (Figs. 83, 85, and 89) to return to its home position, the pawl 1006 is disengaged from the teeth 1032 by contact of the tail of the pawl 1006 with a cam stud 1179 on the frame 134.

The means for so ejecting and inverting the check will now be described. This ejecting and inverting mechanism includes a pair of substantially circular plates 1170 freely mounted on the shaft 1135. Each plate 1170 has a right-angled lip 1171, to which is secured an arcuate-shaped finger 1172, with which cooperates a gripping finger 1173 of a lever 1174 pivoted on a pin 1175 carried by the plate 1170.

In the normal positions of the parts, as shown in Figs. 79 and 81, a spring 1176, connected to a stud 1177 on the lever 1174 and to a stud 1178 on the plate 1170, urges the gripping finger 1173 towards the inner side of the finger 1172, but the finger 1173 is held away from the finger 1172 by means to be later described. The lever 1174 also carries a pin 1180 (Fig. 82) for cooperating with a driving arm 1181, which also cooperates with a pin 1182 carried by the plate 1170.

The lever 1174 (Fig. 81) carries a roller 1185 projecting through an opening 1186 in the plate 1170 to cooperate with a cam 1187, which is angularly adjustable around the shaft 1135. For this purpose of adjustment, the plate 1187 has a pair of studs 1188, which project through concentric slots 1189 in the bracket 1136. By means of the slots 1189 and the studs 1188, the cam plate 1187 can be angularly adjusted around the shaft 1135 to bring its control surface 1190 into the desired position to cooperate with the roller 1185 of the lever 1174. After the control surface 1190 has been adjusted to the proper position, the cam plate 1187 is locked in this adjusted position by means of nuts 1191. In the normal position (Fig. 81), the cam surface 1190, by its contact with the roller 1185, holds the gripping finger 1173 away from the finger 1172 and against the tension of the spring 1176.

During the initial movement of the check, the rack 1151 is moved to the left in the manner described above. During this movement of the rack to the left, which rotates the shaft 1135 clockwise, the operating arms 1181 are, of course, moved clockwise, and the floating or loosely mounted plates 1170 move clockwise, keeping the pins 1182 against the arm 1181 due to the fact that most of the weight of the plates 1170 is in the normal position on the right-hand side of the shaft 1135.

During the first part of the clockwise movement of the plates 1170, the surfaces 1190 of the stationary cams 1187 hold the fingers 1173 away from the fingers 1172. Then, as the rollers 1185 leave the surfaces 1190, the springs 1176 rock the levers 1174 clockwise on their pins 1175 until the fingers 1173 contact the fingers 1172. At this time, there is no check between the fingers 1172 and 1173.

However, as the arms 1181 continue their clockwise movement, the gap between the arms and the pins 1180 on the gripping levers 1174 will be closed, and the arms 1181 continue to carry the plates 1170 clockwise until the parts reach the position shown in Fig. 82.

When the plates 1170 have reached this position, a stud 1194 on each plate contacts a square stud 1195 on each stationary bracket 1136, thus stopping the clockwise movement of the plates 1170. After this, the shaft 1135 and the arms 1181 have still a slight clockwise movement to go to reach the maximum position of their clockwise rotation, during which time the arms 1181, through their engagement with the pins 1180, rock the levers 1174 counter-clockwise around their pivot pins 1175, thus opening the gripping fingers 1173, or, in other words, moving these fingers 1173 away from the inside of the fingers 1172, so that the check 152 may be fed between the fingers 1172 and the fingers 1173, as shown in Fig. 82. In this figure, the check 152 is shown

as just entering the space between the fingers 1172 and 1173, and during the net pay operation it will be fed farther on to the left, just prior to the time that the ejecting and inverting take place.

After all of the printing has taken place on the check 152 during the net pay or ninth print operation, according to Fig. 71, the arm 984, under control of means to be described hereinafter, releases the block 1167 from the notch 1166 in the rack 1151.

Upon the release of the block 1167 from the notch 1166, the tensioned spring 1153 very rapidly moves the rack 1151 to the right to rapidly rotate the shaft 1135 and the arms 1181 in a counter-clockwise direction to their normal positions. During the very first part of this counter-clockwise movement of the arms 1181, they move away from the pins 1180 and contact the pins 1182 on the plates 1170. As the arms 1181 leave the pins 1180 on the levers 1174, the springs 1176 rock the levers 1174, thus causing the fingers 1173 to firmly grip the check 152 between themselves and the inner side of the fingers 1172.

Now the further counter-clockwise rotation of the arms 1181 by their engagement with the pins 1182 rocks the plates 1170 counter-clockwise, whereupon the fingers 1172 and 1173 eject the check 152 from the machine. During this ejection of the check, it is inverted, and its leading edge eventually comes into contact with the edges of the brackets 1136. However, just prior to the contact of the leading edge of the check 152 with the brackets 1136, the rollers 1185 of the levers 1174 have contacted the high surfaces 1190 of the cams 1187, thus rocking the levers 1174 counter-clockwise against the action of the springs 1176, thereby opening up the fingers 1173 and 1172 or, in other words, removing the fingers 1173 from the check 152, thus leaving the check free to drop upon the shelf 1130.

Now, upon the further counter-clockwise movement of the plates 1170 to their normal positions, since the leading edge of the check is contacting the edge of the brackets 1136, the check cannot move any farther, and consequently the open fingers 1173 and 1172 will be moved past the edges of the check 152, whereupon it will fall onto the shelf 1130, shown in Figs. 1 and 79.

It might be stated here that, at the time the plates 1170 are being rocked clockwise, the rollers 1185 of the levers 1174 contact the high surfaces 1190 of the stationary cams 1187 and open the fingers 1172 and 1173, but during this time, since there is no check or statement between the fingers, this movement is merely an idle one, and, as soon as the rollers 1185 pass off the upper sides of the high surfaces 1190, the springs 1176 rock the levers 1174 into a position whereby the fingers 1173 again contact the inside of the fingers 1172.

The means for releasing the latch 984 (Figs. 66 and 103) from the pin 983 on the tension roller bell crank 978 is under control of a group of selector plates, which are designated plate group 1200 and are shown in Figs. 57—B and 84 and in space 4 of the chart diagram (Fig. 65). There are only two plates in this group, plate No. 2 being controlled by the differential of row 2 and plate No. 3 being controlled by the differential of row 1. The control chart in Fig. 65 shows that plate No. 2 has notches in the 2, 3, and 4 Arabic positions and that the plate No. 3 has notches in the 0 and 6 Arabic positions. The notches 2, 3, and 4 of plate 2 are to cause the ejection of the ticket 156 (Fig. 25), which is printed upon during analysis operations, and the 0 and 6 notches in plate No. 3 on the Arabic side are used in combination with the notches 2, 3, and 4 of plate 2 during the analysis operation. The plate No. 2 also has notches in the Roman II, IV, and IX positions, the II and IV positions of which are for analysis, and the plate No. 3 has notches in the 0, IV, and V Roman positions, which are also used during analysis. Plate No. 2 has a notch in the Roman IX position, which corresponds to the 9 position of the row 2 differential, which is selected during the net pay operation in order to obtain the employee's net pay from the crossfooter, and the Roman I position is notched in plate 3 because this is the position which corresponds to the Net pay key 162. In other words, the plate 2 must be in the 9 position and the plate 3 must be in the 1 position in order that the feeler mechanism may be operated properly to control the release of the latch 984 from the pin 983 to effect an operation of the check ejecting mechanism which has just been described.

Referring now particularly to Figs. 66, 67, and 84, there is a feeler lever 1201, pivoted on the shaft 762, which has a spring 1202 tending to rock this lever counter-clockwise. Pivoted to the lever 1201 is a link 1203, which is also pivoted to an arm 1204 mounted on the stud 1060 and drawn by the spring 1202 against a stud 1205 in an arm 1206, which is fast to the shaft 1056.

It will be remembered that the shaft 1056 is first rocked clockwise and then counter-clockwise by the cams 1051 and 1052 of Fig. 84. During the clockwise movement of the shaft 1056, the stud 1205 is moved away from the arm 1204, whereupon the spring 1202 causes the lower end of the arm 1204 to follow the stud 1205 and move the link 1203 to the left to rock the lever 1201 counter-clockwise, assuming that the plate No. 2 has been set in the 9 position and the plate No. 1 in the 1 position, whereupon the upper finger of the feeler block 767, carried by the lever 1201, will enter the notches in the two plates Nos. 2 and 3 of plate group 1200. The link 1203 carries a pin 1207, which, when the link 1203 is moved to the left, contacts an arm 1208 fast on the shaft 985 and rocks said shaft counter-clockwise, thus releasing the latch 984 from the pin 983 to release the block 1167 from the notch 1166 of the rack 1151, whereupon the spring 1153 actuates the check ejector mechanism in the manner just described.

However, before this check ejector mechanism can be actuated, it is necessary that the pawl 1048 (Fig. 84) be disengaged from the teeth 1049 of the rack 992 and that the pawl 1012 be disengaged from the shoulder 1013 of the bar 1007 and that the pawl 1046 be moved out of the path of the shoulder 1047 on the bar 1007.

In other words, in order for these pawls to be disengaged, it is therefore necessary that the upper feeler of the block 767 on the lever 1201 find notches in the Roman IX position of plate 2 and in the Roman I position of plate No. 3, which are controlled by the differentials of rows 2 and 1, respectively. When this occurs, then, as above mentioned, the lever 1201 will be rocked counter-clockwise by its spring 1202, whereupon a link 1209, pivoted to the lever 1201, will be moved downwardly. This link is forked to surround a stud 1210 of an arm 1211 pivoted on the stud 1014. The outer end of the stud 1210 is cut in a half-round, as shown in Figs. 84 and 102, which half-round overlies the half-round

section of another stud 1212, carried by the pawl 1048.

Consequently, when the link 1209 is lowered, the arm 1211 is rocked counter-clockwise and the half-round section of the stud 1210, through its engagement with the half-round section of the stud 1212, rocks the pawl 1048 counter-clockwise, thus disengaging its operating nose from the teeth 1049 on the rack 992. Since the pawl 1046 is rigidly secured to the pawl 1048, the nose of this pawl 1046 will be moved downwardly out of the path of the shoulder 1047 on the bar 1007. The arm 1211 is integral with a bail 1213, which is secured to an arm 1214 also pivoted on the stud 1014, which arm overlies the stud 1044 of the pawl 1012; consequently, when the arm 1211 is rocked counter-clockwise by the link 1209, the bail 1213 and the arm 1214 are rocked likewise, whereupon the pawl 1012 is moved counter-clockwise to disengage its operating nose from the shoulder 1013 of the bar 1007.

By the mechanism just described, all of the printer feeding mechanism is restored to its normal position, and the tension rollers 965 are moved upwardly by the clockwise rocking of the shaft 969 under the action of the spring 990 when the arm 984 was released from the pin 983 of the bell crank 978.

In order to insure that the check 152 is fully free from the rollers 965 and 964 above the stop 963 and to prevent the stop 963 from striking the paper, the return of the stops 963 to their normal positions is slightly delayed by the following mechanism.

Pivoted on the stud 1152 is a crank arm 1215, which is moved into the position shown in Fig. 103 by a stud 1216 on the rack 1151 as the rack is moved from the position shown in Fig. 79 to the left to the position shown in Fig. 103. This, through a link 1217, which is pivoted to the crank 988, rocks the crank 988 into the position shown in Fig. 103, wherein it is beneath the pin 989 on the link 980, which holds the stops 963 down into the position shown in Fig. 103. When the rack 1151 is moved to the right by the spring 1153 to eject the check 152, an arm 1218, integral with the crank 1215, is held in the position shown in Fig. 103 until after the stud 1216 passes from beneath this arm 1218, which gives the check sufficient time and makes it positively sure that the check is out from between the rollers 965, which have been raised in the manner previously described upon the release of the arm 984 from the pin 983 so that the spring 990 can move the crank 988 and consequently the shaft 987 and the arm 986 counter-clockwise when the pin 989 is moved to the left off of the projecting finger of the crank 988, so that, under the action of the spring 990, the fingers or stops 963 will be moved up into their normal positions, ready to stop a second hand-inserted check 152 in the position shown in Fig. 71.

Summary feed and space and line selection

It will be recalled that the payroll summary 151 (Fig. 28) carries the names of several employees, the number depending upon the particular system which the company uses that writes payroll checks on the machine shown in this invention.

As shown in Fig. 28, there is a space allotted to each employee, and in this space are shown two lines of printing; for example, in column 2 the Gross pay is in the top line of the space and the Net pay is in the bottom line of the space, in connection, for example, with John Doe, the employee whose complete records are shown in the first space of the payroll summary. The consecutive number is in the bottom line of the space. The deductions may be in the top line or the bottom line or in both lines of any particular column, depending upon what the deductions are. In connection with this present invention, there is special novel means for selecting either the top line or the bottom line of the space under control of the keys in rows 1, 2, 3, and 4.

There is also a novel mechanism to feed the summary 151 from the bottom line of one space—for example, the space allotted to John Doe—to the top line of the next succeeding space—for example, the space allotted to Richard Roe—during the operation of the machine in which the prior earnings is entered. Therefore, the summary will be set during the very next operation of the machine when the employee's number of hours and earnings for those hours are entered in the top line of the first space, so that the hours and the amount will be printed in the top line of the first space, as indicated in columns 3 and 4 by the printing "R—40.00" and "R—50.00."

The payroll summary 151 is adapted to be fed by three feed rollers 1240 (Fig. 45), which are secured to a shaft 1241 supported by the printer frames 131, 132, and 133, as shown in Fig. 42—A.

Cooperating with each of the feed rollers 1240 is a tension roll 1242 (Fig. 68) carried by a yoke arm 1243 mounted under spring tension on a shaft 1244 supported by brackets 1245 fastened to the base 123. The tension rolls and their arms 1243 are held in contact with the summary strip on top of the feed rollers 1240 under spring tension in exactly the same manner as the tension rollers 965 are held in contact with the check on the feed rollers 964, as described previously.

Normally the tension rolls 1242 are engaged with the feed rollers 1240, as shown in Fig. 68, and, so that a payroll summary 151 can be inserted in the machine to the proper position so that it can be fed into position to receive the first print of the hours and the amount for those hours, the rolls 1242 must be disengaged from the rollers 1240 by a hand-operated lever 1251, described later. The operator then puts the summary 151 into the machine until the double line immediately below the words "Employee's name" is in line with the front edge of a short bar 1246 (Fig. 1), under which the edge of the payroll summary 151 is placed when being inserted in the machine. After the insertion of the payroll summary into the machine, it is necessary to move the tension rolls 1242 into engagement with the payroll summary to grip it between them and the feed rollers 1240 and also to remove the machine lock so that the machine can be released for operation. This machine lock consists of a lever 1247 like the lever 917 of Fig. 66. This lever 1247 is connected by a link 1248 to an arm (not shown) secured to the shaft 628 (Figs. 33 and 34), which, it will be recalled, is connected to the release shaft 149, which is moved clockwise to operate the machine, and, when it is thus moved clockwise, the lever 1247 is rocked clockwise through the link 1248. However, as shown in Fig. 68, when the tension rolls are off, the lever 1248 cannot be rocked clockwise due to the fact that a lock arm 1249, pivoted on the shaft 1241, is beneath a finger 1250 on the lever 1247.

At the time the tension rolls 1242 are moved into active position, the lock arm 1249 is moved out of its locking position with relation to the

finger 1250 by the following means. The lock arm 1249 has a finger 1251 normally engaged by a shoulder 1252 of an arm 1253 under the action of a spring 1254. This arm 1253 is loose on a shaft 1255 supported by the printer frames 131, 132, and 133. Pivoted on a stud 1256 on the printer frame 131 is the above-mentioned hand-operated lever 1257 (Figs. 39 and 69), which is mounted between the frame 131 and a guide plate 1258 secured to the frame 131

In Fig. 69, the lever 1257 is shown in its normal position. When this lever is moved to the left, to the "Tension on" position, indicated by dot-and-dash lines, a link 1259 pivoted thereto, and also pivoted to an arm 1260 fast on the shaft 1255, rocks the shaft 1255 clockwise, whereupon a stud 1261 on an arm 1262 fast to the shaft 1255 contacts the upper side of the arm 1253, rocking the same clockwise against the tension of the spring 1254 and releasing the shoulder 1252 from the finger 1251 of the lock arm 1249, whereupon a spring 1263, attached to the arm 1249, rocks the same counter-clockwise to move its upper end from beneath the finger 1250 of the lever 1247. At the same time, the finger 1251 will be engaged by a shoulder of the notch 1252 to hold the latch arm 1249 in the unlocked position so that the lever 1247 may be rocked clockwise to allow the release shaft 149 to be rocked clockwise to release the machine for operation.

As the arm 1262 is rocked clockwise, an arm 1264, integral with the arm 1262, contacts a stud 1265 on a link 1266 and moves the link from the position shown in Fig. 68 toward the right, whereupon a stud 1267, carried by the link 1266, rocks a forked arm 1268, which is fast to the shaft 1244, counter-clockwise, thus allowing the tension rolls 1242 to be moved down into contact with the summary on top of the feed rollers under spring tension in exactly the same manner that the rollers 965 of Fig. 103 are rocked down against the check which lies above the feed rollers 964 for the check.

The link 1266 is slidably mounted at its left end on a shaft 1269 supported by the printer frames 131, 132, and 133, and at its right end the link 1266 is pivoted to the upper end of a crank arm 1270, which is journaled on a stud 1271 carried by the printer frame 133. Movement of the link 1266 to the right rocks the crank arm 1270, whereupon a stud 1272 thereon is moved beneath a notch in a latch 1273 fast on a shaft 1274 carried by the printer frames 131, 132, and 133. A spring 1275 normally holds the latch against the stud 1272, and, as the stud 1272 is moved to the right, as viewed in Figs. 68 and 69, the spring 1275 will rock the latch, whereupon its notch will engage the stud 1272 and hold the crank arm 1270 in its moved position, thus maintaining the tension rolls 1242 in their effective positions with reference to the feed rollers 1240.

After the particular run of checks for employees listed on the payroll summary 151, which may be any number, such as 50 or 60, in order to get the payroll summary out of the machine again, it is necessary to release the tension rolls 1242 so that the summary can be taken out without being torn. To do this, there is also secured to the shaft 1255 a forked arm 1276 (Figs. 69 and 70) engaging a stud 1277 on a link 1278 slidably mounted on the shaft 1269 and a stud 1279 on the frame 131. This link 1278 carries a pin 1280 adapted to cooperate with an arm 1281, which is secured to the latch shaft 1274.

To release the tension rolls to insert and to withdraw the summary 151, the operator moves the lever 1257 (Fig. 69) to the right, whereupon, through the link 1259 and the arm 1260, the shaft 1255 is rocked counter-clockwise and the arm 1276 moves the link 1278 to the left, whereupon the pin 1280 contacts the arm 1281 and rocks the shaft 1274 counter-clockwise, which raises the latch 1273, or, in other words, rocks it counter-clockwise, and disengages its notch from the stud 1272, whereupon a spring 1282, attached to the crank 1270, rocks the same counter-clockwise to the position shown in Fig. 69, thus moving the stud 1272 under the main body of the upper arm of the latch 1273.

At the same time the shaft 1255 is rocked counter-clockwise, the stud 1261 on the arm 1262 rocks the lock arm 1249 from its released position back into the position shown, whereupon its upper end is beneath the finger 1250 of the lever 1247, thus preventing any clockwise movement of the machine release shaft 149 while the tension rollers are disengaged from the feed rollers 1240.

There is a safety device in the machine to prevent the tension rolls 1242 from being released during the operation of the machine. This device consists of a roller 1283 carried by the crank 1270, which roller, after the crank 1270 has been rocked clockwise by the movement of the link 1266 to the right, when the rolls 1242 are moved into effective position, is moved downwardly from the position shown in Fig. 69, away from the smaller radii of a cam 1284 fast on the printer shaft 370. As this shaft is rotated clockwise, the high part of the cam 1284 will be moved into contact with the roller 1283 and thus block any movement of the crank 1270 by its spring 1282, so that, even though the operator should move the lever 1257 to the right to release the tension rolls and lock the machine, it would be of no effect, because the latch 1273 would merely be rocked counter-clockwise and released from the stud 1272, but its spring 1275, as soon as the operator released the lever 1257, would immediately rock the latch 1273 again clockwise, whereupon the notch in the upper arm of the latch would again engage the stud 1272 and hold the parts so that the tension rolls 1242 would still remain in effective position. Then, as the shaft 370 arrives at its normal position, the lever 1257 may be moved clockwise to release the tension rolls 1242 to withdraw the summary 151 at the end of any operation following a net pay operation.

In order to feed the summary from the top line of any space to the bottom line of that space, or from the bottom line of any space to the top line of the same space, and also to feed the summary from the bottom line of one space to the top line of the next succeeding space, there are three ratchets 1290, 1291, and 1292, all secured together and all fastened to the shaft 1241. Cooperating with the ratchet 1290 is a pawl 1293. A spring 1294 normally holds the pawl 1293 in engagement with the ratchet 1290, to turn the feed rollers 1240 to feed the summary 151 from the bottom line of any one space to the top line of the next succeeding space. This pawl 1293 operates, by means to be described hereinafter, during each operation of the machine when the employee's prior earnings is picked up from the card and entered into the machine in the "G. T. 2" totalizer when the Prior earnings key 164 is depressed.

A pawl 1295 (Figs. 59 and 60) is held in coop-

eration with the ratchet 1291 by a spring 1296 to feed the payroll summary from the top line of any one space to the bottom line of the same space. This pawl 1295 is controlled by the Net pay key 162, the T, X, M, and K keys 166, the B, D, F, H, and J keys 165 to cause the pawl 1295 to feed the payroll summary 151 if, during the operation preceding that, the printing occurred in the top line of that same space. This pawl 1295 is controlled by the R, S, N, and L keys 166, the A, C, E, and K keys 165, and the Gross keys 162 to prevent any feed of the summary when any one of those keys is depressed, if the last printing prior to the depression of those keys was in the top line of that particular space which is being printed in.

A pawl 1297 (Fig. 59) is adapted to cooperate with the ratchet 1292 by a spring 1298 to feed the payroll summary from the bottom line in any one space to the top line in the same space under control of the Gross pay key 162, the R, S, N, and L keys 166, and the keys A, C, E, and G 165, when the last previous printing in said space occurred in the bottom line of that space. This pawl 1297 is also adapted to be controlled by the Net pay key 162, the keys T, X, M, and K 166, and the B, D, F, H, and J keys 165 to prevent any feed of the payroll summary 151 when the last preceding print occurred in the bottom line of that particular space.

Pawls 1293, 1295, and 1297 are all pivoted on an operating link 1300 forked to slide on a hub on the ratchet 1291 at its left end and at its right end pivoted to an arm 1301, which is journaled on a stud 1302 carried by the printer frame 132. A spring 1303 holds a roller 1304 on the arm 1301 against a cam 1305, which is secured to the printer shaft 370.

During each operation of the shaft 370, the cam 1305 moves the link 1300 first to the left and then back to the right to the position shown in Fig. 59; that is, it permits the spring 1303 to move the link 1300 back to the right.

As the link 1300 moves to the left, if the pawl 1293 is in engagement with the ratchet 1290, the payroll summary will be fed from the bottom line of any space to the top line of the next succeeding space. If the pawl 1295 is in engagement with its ratchet 1291 during this left movement of the link 1300, the payroll summary 151 will be fed from the top line of any space to the bottom line of that same space, and, if the pawl 1297 is in engagement with its ratchet 1292, the summary 151 will be fed backwardly from the bottom line of any space to the top line of the same space.

The engagement and disengagement of the pawls 1293, 1295, and 1297 with and from their respective ratchets 1290, 1291, and 1292 are controlled by two groups of notched control plates which are numbered plate groups 1306 and 1307 (Figs. 39 and 57—A). Plate group 1306 consists of four plates, as shown in space 2 of the control chart in Figs. 64—A and 64—B, and these plates are under the control of the keys of rows 1, 2, 3, and 4. The plate group 1307 consists of only two plates, as shown in space 1 of the control chart of Fig. 65, and these two plates are under the control of the keys in rows 1 and 2. The plate group 1306 controls all three pawls, and the plate group 1307 controls only the feed pawl 1293.

Cooperating with the plate group 1306 is a feeler lever 1308 pivoted on the shaft 762. This lever has a finger 1309 cooperating with a pin 1310 on an arm 1311, which is fast to the shaft 762, which, it will be recalled, is given first a counter-clockwise movement and then a clockwise movement back to its normal position during each cycle of operation of the machine. The feeler lever 1308 has an arm 1312 cooperating with a pin 1313 on the feed pawl 1293. Secured to the feeler lever 1308 by means of a sleeve 1314 is a feeler lever 1315 (Fig. 59) having a finger 1316, cooperating with a pin 1317 on the pawl 1297, and a finger 1318, cooperating with a pin 1319 on the pawl 1295. A spring 1320, connected to the pin 1318 and to a stud on the lever 1315, holds the finger 1309 normally in contact with the pin 1310, so that, when the arm 1311 is moved counter-clockwise, the levers 1308 and 1315 will be moved likewise under control of the plates in plate group 1306. Carried between and by the levers 1308 and 1315 is a feeler block 767, which, in cooperation with the notches and high spots on the plate group 1306, will determine whether or not the levers 1308 and 1315 will be rocked counter-clockwise to control the pawls 1293, 1295, and 1297.

In might be noted that in Fig. 62 the lever 1308 has been shown in the moved position, with the lever 1315 omitted. The lever 1308—that is, a portion of it, is shown in its normal position in Fig. 60.

By referring to space 2 of the control chart of Figs. 64—A and 64—B, it will be noted that plate No. 1, which is the plate shown in Fig. 59, has notches in the Arabic 0 and 3 positions, which correspond to the add position of the differential of row 1, and to the gross key 162 position in row 1. The plate No. 2, which is controlled by the differential of row 4, has notches in the 0, 2, 4, 6, and 8 positions, which correspond to the 0 position of the differential and to the L, K, S, and R keys 166 of row 4. The plate No. 3, which is controlled by the differential of row 3, has notches in the 0, 3, 5, 7, and 9 positions on the Arabic side, which correspond to the 0 position of the differential and to the keys 165, G, E, C, and A of row 3. The plate No. 4 of this group has notches in the 5, 6, 7, 8, and 9 positions on the Arabic side, which correspond to the Release key, the Minus key, the Prior earnings key, and the Plus key 164 of row 2, the release key being the automatic position for the differential of row 2, it will be recalled, when any of the keys 165 A to J or keys 166 N to K are operated for the purpose of controlling deductions to be taken from the crossfooter.

Therefore, it can be seen that, in this combination of plates 1306 controlled by rows 1, 2, 3, and 4, when the lower finger of the feeler block 767 finds notches in all of the plates, the levers 1315 and 1308 will be rocked counter-clockwise by the spring 1320 when the arm 1311 is moved counter-clockwise. This counter-clockwise movement of the lever 1315 causes the finger 1318 to contact the pin 1319 of the pawl 1295 and disengage it from the ratchet 1291 and, the finger 1316 being lowered, will permit the spring 1298 to rock the pawl 1297 counter-clockwise to engage it with the ratchet 1292. At the same time, the arm 1312 of the lever 1308, by its contact with the pin 1313 of the pawl 1293, will disengage this pawl from its ratchet 1290, and consequently, when the link 1300 is moved to the left, the only pawl which will do any feeding will be the pawl 1297, which is the pawl that feeds the payroll summary 151 from the bottom line of any space to the top line in that particular space.

According to the notches in the Arabic side of the plates of plate group 1306, as just described,

when any of the keys 165, A, C, E, or G, or any of the keys 166, S, N, L, or R, or the Gross key 162 is depressed, the payroll summary will be fed backwardly from the bottom line in any one space to the top line in that space, assuming that it stood in a position to receive a print in the bottom line of that space at the beginning of that operation.

In the operation just described, the pawl 1297 would have engaged the ratchet 1292 up against the tooth as shown in Fig. 62 and would have turned this ratchet to back-space the summary 151 from the bottom line to the top line in the space.

However, at the end of this operation, the ratchet 1292 will be left in the position shown in Fig. 59, and consequently, should one of the same keys just mentioned be depressed for a subsequent operation when the pawl 1297 is permitted to engage the ratchet 1292, it will engage the ratchet not against the radial side of the tooth but near the top of the tooth, as indicated by the dot-and-dash arc from the end of the pawl to the ratchet tooth, and consequently, when the link 1300 is moved to the left, the pawl 1297 will not turn the ratchet but will simply move idly up against the radial face of the tooth ahead of the pawl, thus preventing any movement of the summary at this time, since the printing is to take place in the top line of the space as it had done during the previous operation.

In order to feed the summary 151 from the top line in any one space to the bottom line in the same space, the pawl 1295 must turn the ratchet 1291. This pawl 1295 is controlled by the lever 1315, and, as shown in Fig. 59, it is in a position to feed because the ratchet 1292 shows that the last print was in the top line of the space.

However, instead of notches in the plates 1, 2, 3, and 4 of group 1306 to control the pawl 1295, high spots on these plates control, and therefore, whenever the lower finger of the block 767 finds a high spot on any one of the four plates of group 1306, the pawl 1295 remains in operating position. The high spots are, as far as the lower finger is concerned, in the complemental positions, or the opposite positions from the low spots. In other words, in plate 1, in the Arabic positions, there will be a high spot in the 2 and 4 to 9 positions, and in plate No. 2, controlled by row 4, there will be high spots in the 1, 3, 5, 7, and 9 positions. In plate No. 3, controlled by row No. 3, there will be high spots in the 2, 4, 6, and 8 positions, and in plate No. 4, controlled by row 2, there will be high spots in the 0, 1, 2, 3, and 4 positions, so that the lower finger of the block 767 will find high spots whenever any of the keys 165, B, D, F, H, and J of row 3 are depressed, or when any of the keys 166, T, X, M, and K of row 4 are depressed, or when the Net pay key 162 of row 1 is depressed, and also when the differential of row 2 is stopped in the fifth position under control of the deduction keys 165 and 166 and in the ninth position under control of the keys 166, R, T, S, and X, which are earnings keys.

Since it takes a high spot to control the block 767, there must also be high spots opposite the upper finger on the block 767. As shown in the chart (Figs. 64—A and 64—B), a high spot is provided in all the Roman number positions of plates No. 1, No. 2, and No. 3, and also in all the Roman number positions of plate No. 4, except in the Roman IX position. Therefore, when any of the keys just mentioned are depressed, both feelers of the block 767 will find high spots on at least one of the cams of the plates, and consequently the spring 1320 will not be permitted to move the levers 1315 and 1308 counter-clockwise. Therefore the levers 1315 and 1308 will be in the positions shown in Figs. 59 and 60, wherein the finger 1316, by its engagement with the pin 1317, has the pawl 1297 disengaged from its ratchet 1292, and the finger 1318, being away from the pin 1319, has permitted its spring 1296 to move the pawl 1295 into engagement with the ratchet 1291. Therefore, when the link 1300 is moved to the left, the pawl 1295 will turn the ratchet 1291 to feed the payroll summary form the top line in any one space to the bottom line in that same space.

This movement of the ratchet 1291 from the postion shown in Fig. 60 to feed the summary from the top line to the bottom line of any one space is not a full-tooth movement of the ratchet 1291, and consequently, should the next print be required in the same line of the same space, the pawl 1295 will not engage the radial side of the next succeeding tooth but will engage the angular side of the same tooth that it did in the preceding operation. Consequently it will be an idle movement of the pawl 1295, and therefore there will be no feeding of the summary when successive prints are to be made on the same line in the same space.

To feed the summary 151 from the bottom line of any one space to the top line of the next succeeding space requires engagement of the pawl 1293 with the ratchet 1290 to turn said ratchet clockwise. This engagement of this pawl 1293 with its ratchet 1290 is under the control of the two plates in the plate group 1307.

The feed pawl 1293, which feeds the summary from the bottom line in one space to the top line in the next succeeding space, is under control of the plate group 1307, which is shown in space 1 of the control chart (Fig. 65) and consists of two plates, plate 2 and plate 3. In this particular instance, the low spot prevents feeding and the high spots cause a feeding of the summary by the pawl 1293. The plate No. 2, which is controlled by the differential of row 2, has low spots in the 0 and 9 Arabic positions and low spots in the Roman V, VI, and VIII positions. The plate No. 3, which is controlled by the differential of row 1, has notches in the 0, 2, and 3 Arabic positions and notches in the 0, 1, 2, and 3 Roman positions. This pawl 1293, in addition to being controlled by the feeler lever 1308, is under control of a feeler lever 1325, which is pivoted on the shaft 762 and has a finger 1326 held in contact with the pin 1310 of the arm 1311 by a spring 1327. This lever carries a feeler block 767 (Figs. 60 and 63) and has an arm 1328 cooperating with the pin 1313 of the pawl 1293.

Whenever the plates of group 1307 present notches to the lower finger of the block 767, the lever 1325 is rocked counter-clockwise by the spring 1327 when the arm 1311 is rocked counter-clockwise, and consequently the arm 1328 will contact the pin 1313 and hold the pawl 1293 in the position shown in Figs. 60 and 62, in which position it is disengaged from its feed ratchet 1290.

By referring to the control chart (Fig. 65), it will be noted that the lower finger of the block 767 will find notches in the plate No. 2 whenever the row 2 differential is stopped in the 0 position or the 9 position, and that this corresponds to the 0 or add position of row 1 and also the earnings-to-date key 162 position and the gross key 162 position, and consequently, when the machine is operated with any of these keys, Earnings-to-date or Gross, depressed or during add operations

with any deductions or earnings, the pawl 1293 will be held out of engagement with its ratchet 1290 and there will be no feeding of the summary.

It also shows that the upper feeler of the upper finger of block 737 will find a notch whenever the differential of row 2 is stopped in the 5, 6, or 8 position, which corresponds to all of the deduction positions and the two correction positions for deductions or earnings on the Roman position, and that the row 1 differential has a notch in the zero position, the net pay key position, the earnings-to-date key position, and the gross key position, and therefore, when any of these keys are depressed, the lever 1325 will be rocked counter-clockwise to hold the pawl 1293 disengaged to prevent feeding of the summary.

However, in the 7 position of row 2, there will be a high spot on the Roman side and also on the Arabic side of plate No. 2, and, since there is a high spot in that position, the lever 1325 will not be permitted to rock counter-clockwise, as shown in Fig. 60, and consequently the arm 1328 will be held up away from the pin 1313 and the spring 1294 will engage the pawl 1293 with the ratchet 1290, so that, upon an operation of the machine where the prior earnings are picked up to be put into the "G. T. 2" totalizer, which requires an operation of the Prior earnings key, the payroll summary 151 will be fed from the bottom line of any one space one step to the top line of the next succeeding space, so that, on the very next operation, when the hours and earnings are entered, they will be printed in the top line of the proper space for that new employee.

At this point and with reference to Figs. 59, 60 and 62, it might be well to summarize the feeding of the payroll summary shown in Fig. 28, and with particular reference to the correlation of the feeding pawls 1293, 1295 and 1297 and the feeding ratchets 1290, 1291 and 1292 respectively with which said pawls cooperate to drive them to feed the payroll summary into its several positions to receive the printed impressions relating to the several employees' names, two of which names are shown in the left hand column in Fig. 28.

As has been previously described each employee is allotted a certain space in which there are two lines of printing; for example, the employee's gross pay is printed on the top line and his net pay is printed on the bottom line in the particular space allotted to that employee.

The three ratchets 1290, 1291 and 1292 are all secured together and are secured to the shaft 1241 to which is also secured the feed rollers 1240.

The ratchets 1290 and 1291 are staggered as shown in Fig. 62; that is, their teeth do not coincide one with the other. Since all three ratchets are secured together a feeding movement of any one of them by its associated pawl turns the other two ratchets. All three pawls being carried, as previously described, by the feed link 1300 always move a constant definite distance, the travel of which is sufficient to turn the ratchets a distance of one half of a tooth.

The ratchets 1290 and 1291 and their associated pawls 1293 and 1295 feed the summary forwardly and the ratchet 1292 and its associated pawl 1297 feed the payroll summary backwardly.

The pawl 1295 operates its ratchet to feed the payroll summary from the top line of an employee's space to the bottom line of the same space for the same employee. The pawl 1297 operates the ratchet 1292 to feed the summary backwardly, when necessary, from the bottom line of an employee's space to the top line of the same employee's space.

The pawl 1293 operates the ratchet 1290 to feed the summary from the bottom line of one employee's space to the top line of the next employee's space.

The feeler lever 1315 when in the position shown in Fig. 59 contacts the stud 1317 and holds the back spacing or feeding pawl 1297 disengaged from its ratchet 1292. At the same time the lever 1315 is withdrawn from the stud 1319 thus permitting the pawl 1295 to engage its ratchet 1291. At this time the pawl 1293 is held disengaged from its ratchet 1290 as shown in Fig. 60 by the arm 1328 of the lever 1325. Therefore when the link 1300 is operated the pawl 1295 drives the ratchet 1291 to feed the payroll summary. During this operation the lever 1308 being secured to the lever 1315 has its arm 1312 disengaged from the stud 1313 of the pawl 1293 but as above stated, the arm 1328 of the lever 1325 prevents engagement of the pawl 1293 at this time.

When the pawl 1293 is to feed the summary the lever 1325 raises its arm 1328 away from the stud 1313 and at the same time lever 1308 raises its arm 1312 off from the pin 1313 thus permitting the pawl 1293 to engage its ratchet 1290. Since the lever 1315 is secured to the lever 1308 the arm 1318 is disengaged from the stud 1319 and consequently the pawl 1295 is engaged with its ratchet 1291; however, due to the positions of the ratchets 1290 and 1291 at this particular time even though the pawl 1295 is moved to the left as viewed in Fig. 59 when the pawl 1293 is moved to the left to operate its ratchet 1290, the movement of the pawl 1295 is merely an idle movement and plays no part in the feeding of the payroll summary at this time, while the pawl 1293 is driving the ratchet 1290 to feed the summary.

During this feeding of the summary by the pawl 1293, the lever 1315 being in the position shown in Fig. 59, holds the back feed pawl 1297 disengaged from its ratchet 1292.

When the back feeding pawl 1297 is engaged with its ratchet 1292 to drive the same to feed the payroll summary backwardly the lever 1315 will have been moved counter-clockwise so that its arm 1318 will disengage the pawl 1295 from its ratchet 1291 and permit the pawl 1297 to engage the ratchet 1292. The above counter-clockwise movement of the lever 1315 also moves the lever 1308 counter-clockwise to the position shown in Fig. 62 whereupon its arm 1312 holds the pawl 1293 disengaged from its ratchet 1290.

To aline the ratchets 1290, 1291, and 1292 so that their teeth will always be in the proper positions with relation to their feeding pawls, there is secured to the feed shaft 1241 a serrated lining disk 1330 (Figs. 39 and 47), with which cooperates a pin 1331 on a crank 1332 pivoted on the rod 744. A spring 1333 holds the pin 1331 against the serrated disk 1330 at all times to act as a snap aliner while the ratchets are being operated to feed the summary, and at the end of the feeding movement to insure that all the ratchets are in their proper positions, ready to be actuated by their pawls on subsequent operations.

During the time of printing of the summary record, it is very desirable to positively lock the shaft 1241 and consequently the feed rollers 1240, so that there can be no chance of any movement of the summary during the time the printing is

taking place, in order to prevent smearing. Therefore a positive alining mechanism is provided for the shaft 1241 and the feed rollers 1240, which consists of an aliner 1334 having pivoted thereto a link 1335, which is pivoted to a crank 1336 journaled on the shaft 737. This crank carries rollers 1337 and 1338 cooperating with companion cams 1339 and 1340 secured to the printer drive shaft 370. These cams 1339 and 1340 are shown in space 19 of the time chart (Fig. 109).

Just prior to the printing of the summary by the various hammers 701 to 711, the cams 1339 and 1340, through the crank 1336 and the link 1335, rock the aliner 1334 counter-clockwise into engagement with the serrated disk 1330 to positively aline the summary 151 during the time printing is taking place.

As shown in Figs. 46—A and 46—B, there are two sets of these cams 1339 and 1340; the left-hand set in Fig. 46—A are for alining the summary 151, and the right-hand set (Fig. 46—B) are for the purpose of alining the earnings record 153 in exactly the same manner that the summary 151 is alined, the only difference being that the crank 1336 for the earnings record is mounted on the shaft 738, which, it will be recalled, is in axial alinement with the shaft 737.

To provide a protection against tearing the bottom portion of the payroll summary 151 when it is in printing position, as shown in Fig. 68, the cabinet 146 has a lid 1342 mounted on a hinge 1343. The lid 1342 covers the top of a paper chute 1344. To insert the bottom part of the summary 151, the lid 1342 is raised by finger holes 1345 and the summary 151 is curled over the front edge of the lid 1342 and inserted into the chute 1344. The lid 1342 is then closed, whereby a lip 1346 thereon rests on a strip 1347 of the cabinet 146.

Earnings record support space feed and tension mechanism

As has been previously stated, the earnings record 153 is printed by the hammers 720 to 729 inclusive, located at the right-hand side of the machine. In Fig. 1, the earnings record is shown in position ready to be printed on in the top line of space 1.

The earnings record 153 is for one employee only and has a space allotted for each week or other designated pay period. Each of these spaces carries two lines of printing, a top line and a bottom line, as shown clearly in Fig. 29. This top line and the bottom line are selected by mechanism to be described hereinafter, under control of the keys in rows 1, 2, 3, and 4, to determine which line of the space the printing is to be made in. In order to move the earnings record from the top line to the bottom line, and vice versa, there is mechanism substantially identical with that which feeds the summary from the top line to the bottom line, and vice versa, which mechanism will be referred to hereinafter.

As shown in Fig. 75, a portion of the machine cabinet 146 is formed with a shallow channel to provide guiding edges 1350 for the earnings record 153. Near the center of the shallow channel, a deep channel section 1351 is provided, which has therein a slot 1352 for a clearance for a tongue 1353 of a U bar 1354 having a pair of fingers 1355. The fingers 1355 have shoulders 1356, against which the bottom edge of the record 153 is adapted to be placed when the record is put in the machine. These shoulders are formed by cutting away a portion of the top of the fingers 1355, so that the record 153 will lie flat on the shallow channel of the cabinet 146 to be moved inwardly by the fingers 1355 to a selected space position after the card has been placed on the shallow channel. However, the record table may be moved in or out to the desired line before the earnings record 153 is placed on the table. Secured to the bottom of the channel 1131 is a bar 1380 (Figs. 44—A and 75) which has on its top surface line numbers corresponding in number to the number of lines on the earnings record. Such line numbers are used as a guide in conjunction with the front edge of the bar 1354, to set the table to the desired line prior to printing on the record. The top part of the card at this time is against stops 1357 (Figs. 44—B, 74, 77, and 78) of levers 1358 pivoted at 1359 on a plate 1360 having flanges 1361, which are secured to a rear tie bar 1362 of the record movable table. This tie bar 1362 connects parallel bars 1363, which near their front ends have secured thereto blocks 1364. To space the bars 1363 the proper distance apart at the front end, a bail 1365 is secured to the blocks 1364, as clearly shown in Fig. 75. This bail 1365 carries a block 1366, into which the tongue 1353 of the fingers 1355 is secured.

Each of the blocks 1364 carries a roller 1367, which rides on the top edge of a rail 1368. The left-hand rail 1368 is mounted on the printer frame 135 by means of screw studs 1369, and the right-hand rail 1368 is mounted on the printer frame 136 by screw studs 1369. The bottom edges of the rails 1368 are provided with V notches, which cooperate with pins 1371 on spring-drawn arms 1372, which ratchet over the V-shaped notches 1370 as the card table is moved in and out; that is, back and forth, with relation to the front part of the machine. These pins 1371 act as an aliner for the movable record table. To prevent the table from being moved upwardly, the rollers 1367 are retained in their proper rolling relation with the side rails 1368 by bars 1373 secured to the tops of the frames 135 and 136. A spring 1374 is stretched between a flange on each stop lever 1358 and a flange on each plate 1360 to hold the stops 1357 up in the position shown in Figs. 74 and 77, so that the top edge of the earnings record 153 may be placed thereagainst to properly position it with relation to the sliding table.

The back part of the sliding table—that is, the part to which the bar 1362 is connected—is supported on a stationary plate 908 of the summary guide. This plate is secured to the tops of the printer frames 135 and 136 by ears near its front edge and is supported near its rear ends on a three-fingered bracket 1375 mounted by flanges 1376 to the printer frames 135 and 136. The center finger of the bracket 1375 is supported by an auxiliary bracket 1377 secured to the rear tie bar 139.

The plate 908 is cut out above the hammers 720 to 729 to allow them to come into contact with the bottom of the earnings record to take the impression from the type wheels. The plate 908 has clearance slots 1378 to permit the stops 1357 and the flanges 1361 of the plates 1360 to slide back and forth, or, as viewed in Fig. 44—B, from left to right and from right to left. Projecting downwardly from the plate 908 are two flanges 1379 (Figs. 43—B, 44—B, and 78) carrying shouldered studs 1385, which project through cam slots 1386 in a bar 1387 to guide said bar in its movement. The bar 1387 has a horizontal flange 1388,

which overlies pins 1389 on the stop levers 1358. A spring 1390 normally holds the bar 1387 in the position shown in Fig. 76, with the right ends of the cam slots 1386 against the shouldered studs 1385.

As above mentioned, the printing spaces numbered 1 to 25 of the earnings records are adapted to have printing in the top and bottom lines thereof. When printing takes place in the bottom line of any one space, it is necessary to move the stops 1357 down out of the way of the edge of the earnings record, so that it may be fed to receive printing in the bottom line of the space. The means for moving these stops down includes the bar 1387 with its cam slots 1386. Connected to this bar 1387 by pin-and-slot connections is an arm 1391, which is fast on a shaft 1392 supported by the printer frames 135 and 136. Also secured to this shaft 1392 is an arm 1393 having connected thereto the rear end of a link 1394, the forward end of which is slotted to surround and slide on the shaft 731.

The link 1394 has a slot 1395 (Fig. 73), into which projects a stud 1396 on the right end of a link 1397, which in turn is pivoted to a crank 1398 fast on a shaft 1399 supported by the printer frames 135 and 136. Also fast on the shaft 1399 is an arm 1400 connected by a link 1401 to a hand-operated lever 1402 pivoted on the side of the printer frame 136 and guided by a plate 1403, which is secured to the frame. This lever 1402 has three positions—a normal or center position, an "on" position, and an "off" position—which are indicated in Figs. 1 and 73. When the lever 1402 is moved to the "on" position, it is done for the purpose of moving the stops 1357 down out of the path of the record 153 and also for moving the tension rolls, to be described hereinafter, into contact with the feed rolls for the earnings record. At this time—that is, when the lever 1402 is moved to the left, as viewed in Fig. 73, to the "on" position—it will, through the link 1401, the arm 1400, the shaft 1399, the crank 1398, and the link 1397, move the link 1394 to the right, whereupon the arm 1393 will rock the shaft 1392 clockwise. This clockwise movement of the shaft 1392, through the arm 1391, moves the bar 1387 to the right, as viewed in Fig. 76, whereupon the cam slots 1386 move the bar 1387 and its flange 1388 downwardly at the same time that it is being moved to the right. Thus the flange 1388, through the pins 1389 on the stop levers 1358, rocks the stop levers counter-clockwise about their pivots 1359 to move the stops 1357 below the surface of the plate 908 so that the record may be fed.

The stops 1357 are held in their moved position by means of a latch 1404 (Fig. 73), which is secured to a shaft 1405 carried by the printer frames 135 and 136. This latch is adapted to be moved by a spring 1406 connected to a link 1407, which is pivoted to the latch 1404, to engage a pin 1408 on a lever 1409 pivoted on a stud 1410 carried by the printer frame 135. This lever 1409 is connected by a pin-and-slot connection to the link 1394, and consequently, when the link 1394 is moved to the right, the lever 1409 is rocked clockwise and the spring 1406 will then cause the latch 1404 to drop down, whereupon the notch in the forward end of the latch will engage the pin 1408 and hold the lever 1409 and consequently the bar 1387 in their moved positions, which hold the stops 1357 down below the surface of the plate 908.

To prevent any movement of the lever 1402 which will release the stops 1357 during an operation of the machine, there is provided on the cam shaft 370 a cam 1411, which cooperates with a roller 1412 on a latch arm 1413 pivoted on the stud 1410. This latch arm is held in engagement with a latch 1414 pivoted at 1415 on the lever 1409 by a spring 1416.

When the lever 1409 was rocked clockwise by the lever 1402 in the manner described above, the roller 1412 was moved downwardly slightly from the position shown in Fig. 73, and, during the operation of the machine, the high portion of the cam 1411, as it moves around, contacts this roller 1412, thus holding the latch arm 1413 and, through the latch 1414, the lever 1409 in its moved position, so that even though the lever 1402 would be moved to the "off" position to cause the stud 1396 to engage a tail 1417 on the latch and rock the latch to disengage it from the pin 1408, the lever 1409 could not move. Consequently, when the operator released the lever 1402, the latch 1404 would again engage the pin 1408. At the end of the operation, after the printing of the net pay on the employee's check, then, when the lever 1402 is moved to the right, the rocking of the latch 1404 by the stud 1396 releases the lever 1409, whereupon the spring 1390 (Fig. 76) will draw the bar 1387 back to the left to the position shown in Fig. 76, thus raising the flange 1388 and permitting the springs 1374 to raise the stops 1357 to their normal stopping positions.

To feed the record, there is provided a pair of feed rollers 1420 (Figs. 44—A, 44—B, and 73), which are secured to the previously described shaft 920. These feed rollers are driven by a set of ratchets and pawls identical with those shown in Figs. 59, 60, and 62, by the cam 1305, shown in Fig. 46—B, which cam is identical with the cam 1305 which drives the link 1300 to operate the pawls as shown in Fig. 59, under control of a set of four selecting plates, which are numbered plate group 1421, as shown in Fig. 57—B. This plate group 1421 is shown in space 25 of the control chart of Figs. 64—A and 64—B.

This plate group 1421 is similar to the group 1306 shown in space 2 of the control chart (Figs. 64—B and 64—A), with slight differences, which will now be explained. Plate No. 1 of this group 1421 has a notch cut in the 1 position on the Arabic side, because there is to be no net pay printed on the earnings record, such as that printed on the payroll under control of the plate group 1306. In plate 2, the difference between groups 1421 and 1306 is that on the Roman side there is a notch cut in the IX position, which is for the same reason, to prevent the printing of the net pay on the earnings record. Plate No. 3 has a notch cut in the zero position on the Roman side for the same reason, and plate No. 4 has a notch cut in the No. 1 position on the Arabic side, which is also one of the preventing means of keeping the net pay from being printed on the earnings record.

In order to prevent any possible operation of the pawl 1293 (Figs. 60, 61, and 62) in connection with the ratchet 1290, which would feed the earnings record from the bottom line of any particular space to the top line of the next succeeding space, there is provided a single control disk 1422 (Figs. 57—B and 61), which is set by the differential of row 1 through the shaft 484. This disk 1422 has notches in the Arabic 0 to 6 positions to control a lever 1423, which is exactly like the previously described lever 1325 (Fig. 60), which is used to control the feeding

of the summary record by the ratchet 1288 under control of the pawl 1293.

Cooperating with the feed rollers 1420 is a pair of tension rolls 1425, which are mounted like the tension rolls 965 associated with the check, and also the tension rolls 1242, which are associated with the payroll summary. These tension rolls 1425 are normally in a disengaged position, as shown in Fig. 73, and are adapted to be moved into effective position by an arm 1426 forked to engage a stud 1427 on the link 1394, so that the movement of the link to the right in the manner described previously, by the lever 1402, will rock the arm 1426 counter-clockwise and move the tension rolls 1425 into effective position, where they will be latched by the latch 1404.

The tension rollers 1425 must be released from the rollers 1420, so that the earnings record may be removed from the machine after the net pay has been printed on the employee's check, because, as above stated, there is a single record for each employee, whereas the payroll summary has the records of a plurality of employees, and consequently the earnings record must be removed from the machine at the completion of the printing of each employee's payroll check, so that a new earnings record 153 can be placed in the machine to receive the printed data that is printed on the subsequent check for the next employee. The release of these tension rolls 1425 is under the control of notched plates which are numbered plate group 1428 (Fig. 57—B) and shown in space 5 of the control chart on Fig. 65. This plate group has two plates, Nos. 2 and 3. The No. 2 plate is controlled by the differential of row 2 and has a notch in the Roman IX position, and plate No. 3 is controlled by the differential of row 1 and has notches in the Roman I and II positions.

The notch in the ninth position of plate 2 is moved opposite the upper finger of the feeler block 767 (Fig. 73) on a feeler lever 1429 when the differential of row 2 goes to the 9 position during operations of the machine in which the Net pay key 162 is depressed, and also during operations of the machine in which the Earnings-to-date key 162 is depressed. The notches in the Roman I and II positions of plate No. 3 are moved opposite the upper feeler finger of the block 767 on the lever 1429 whenever either the Net pay key of row 1 or the Earnings-to-date key of row 1 is depressed. Consequently, with notches in both plates of the group 1428 opposite the upper feeler on the feeler block 767, a spring 1430 will rock the lever 1429 in the usual manner, whereupon the upper feeler fingers will engage the notches, at which time a pin 1431 of an arm 1432 fastened to the lever 1429 moves the link 1407 to the right (Fig. 73), said link having been moved to the left until the right end of a slot 1433 therein contacts the pin 1431 when the latch 1404 latches the lever 1409 in its moved position.

This latch 1404 has a pin 1434, which cooperates with a notch of a lever 1435 pivoted on the stud 1410 and drawn into the position shown in Fig. 49 by a spring 1436. A roller 1437, secured to the side of the cam 1411, cooperates with the lever 1435 to rock the lever 1435 clockwise at the time the high surface of the cam 1411 is holding the lever 1409 in its latched position. The movement of the lever 1435 by the roller 1437 moves the lever 1435 slightly in a clockwise direction, said lever having previously been moved clockwise by the stud 1396 in the link 1397 when the tension was originally placed on the tension rollers 1425; that is, when they were moved into effective position. With this lever 1435 in the position which it assumes after having been moved by the stud 1396, the pin 1434 lies down in front of the main body of the lever and out of the notch in the lever, and this extra clockwise movement of the lever 1435 by the roller 1437 is to take the pressure off the pin 1434, which is caused by the spring 1436, so as to be sure that the spring 1430 can rock the lever 1429 to cause the feeler finger on the block 767 to enter the notches which are opposite it at that time.

There is also associated with the earnings record mechanism a machine lock arm 1450 (Fig. 73) cooperating with a latch arm 1451, which is operated by a stud 1452 carried by the crank 1398. This lock arm 1450 cooperates with a finger 1453 on a lever 1454, which is connected by a link 1455 to an arm identically like the arm 915 (Fig. 33) fast on the shaft 628 to prevent movement of the machine release shaft 149 whenever the lock arm 1450 is moved underneath the finger 1453 by the crank 1398 when the lever 1402 is rocked clockwise to release the tension rolls 1425 from the feed rollers 1420.

Therefore, it can be seen that the tension rolls 1425 must be in effective position and that an earnings record 153 must be in the machine during payroll run operations or the machine will be locked by the lock arm 1450 in the same manner that the machine is locked by the previously described lock arms 919 and 1249 associated with the check 152 and the payroll summary 151.

Time card and basic payroll mechanism

When a payroll run is made—that is, when a series of payroll checks are written, and at the same time all of the various data previously described is printed on the employee's individual earnings record card 153 and also on the payroll summary 151, which is for a number of employees —the posting information may be obtained from a basic payroll sheet 1460 (Fig. 1) mounted to be fed around a round platen 1461 (Figs. 55 and 56) of the usual type, which is supported in a frame 1462 mounted on top of the cabinet 146. The frame carries the usual paper support 1463 for guiding the paper around the platen 1461. Secured to the platen 1461 is a feed ratchet 1464 operated by a feed pawl 1465 carried on an actuating plate 1466, which is pivoted on the platen shaft. Connected to the plate 1466 is a link 1467, which is coupled with a pin-and-slot connection to a link 1468 pivoted to an arm 1469 carrying a roller 1470, which cooperates with a cam 1471 mounted on a motor-driven shaft 1472. The operating means for this shaft will be described later. The cam 1471, when it moves clockwise, as viewed in Fig. 55, rocks the arm 1469 and draws the links 1468 and 1467 toward the left, thus rocking the actuating plate 1466 counter-clockwise and carrying the pawl 1465 along with it. This pawl 1465 has a roller 1473 extending into a slot 1474 of a hand adjustable lever 1475 pivoted on the platen shaft and held in any one of six positions of adjustment by a retaining pawl 1476. The slot 1474 is widened at the left end, as viewed in Fig. 55, thus forming a drop-off shoulder 1477. In the position shown in Fig. 55, as the plate 1466 is moved to the left, the roller 1473 will not come to the drop-off shoulder 1477 until quite late in the movement of the link 1467, and consequently, when the roller 1473 does come down on the drop-off por-

tion into the wide portion of the slot 1474, a spring 1476 on the pawl rocks the pawl counter-clockwise into engagement with the ratchet 1464, so that the remainder of the movement of the link 1467 will turn the ratchet one tooth to feed the platen 1461 one space.

If the lever 1475 is moved, for example, to its extreme position in a clockwise direction, then the drop-off shoulder 1477 will be much nearer to the roller 1473 when the link 1467 begins to move, and consequently the platen 1461, instead of receiving one step of movement, will receive, in the illustrated form, six steps of movement. There are intermediate positions so that the platen 1461 may be advanced anywhere from one to six steps during each actuating movement of the link 1467 and the actuating plate 1466.

A spring 1479 attached to the link 1467 normally maintains the roller 1470 against the cam 1471 and causes the links 1468 and 1467 to be returned to the right to their normal positions as shown after the platen 1461 has been fed.

A retaining pawl 1480 is held under spring tension in engagement with the ratchet 1464 to prevent any retrogade or backward movement of the ratchet 1464 during the return of the pawl 1465 to its normal position before it is raised off of the ratchet 1464 by the drop-off shoulder 1477.

In addition to the basic payroll sheet 1469 for posting, certain of the posting data is on time clock cards 1483, which are arranged in a stack in a box 1484 (Figs. 1 and 106) mounted on the back of the machine cabinet 146. Upon operation of the Net pay key 162, a picker 1485 is adapted to eject the front card 1483 from the stack downwardly into a position where it will be gripped by a feeding roll 1486 and a tension roll 1487. The tension roll is carried by a pair of arms 1488 and held by a spring 1489 in contact with the feed rolls 1486. The feed rolls 1486 are driven by a belt 1490 from a motor shaft 1491 of a motor 1492 mounted in the box 1484. Therefore, when the bottom of the card 1483 is moved into contact with the rollers 1486 and 1487, it is fed downwardly into a receptacle (not shown) in the bottom of the box 1484.

The motor 1492 drives a pinion 1493, which in turn drives a gear 1494 loose on the shaft 1472. Secured to the gear 1494 is a ratchet 1495 adapted to cooperate with a pawl 1496 carried by a plate 1497, which is fast to the shaft 1472. The pawl 1496 is held normally disengaged from the ratchet 1495 by a finger 1498 of a lever 1499 pivoted on a bracket 1500 carried by the box 1484. A spring 1501 normally tends to rock the lever 1499 counter-clockwise but is prevented from so doing by a latch 1502 held in engagement therewith by a spring 1503. The latch 1502 is pivotally connected to a plunger 1504 of a solenoid 1505, which, when energized, raises the plunger 1504, releasing the latch 1502 from the lever 1499, whereupon the spring 1501 moves the lever counter-clockwise, thus releasing the pawl 1496 to the action of a spring 1506, which rocks the pawl into engagement with the ratchet 1495, whereupon the plate 1497 is rotated clockwise by the gear 1494 and the ratchet 1495 to drive the shaft 1472. Pivoted at 1507 to the plate 1497 is a crank 1508, which in turn is pivoted to a bar 1509; which carries the card picker 1485. Consequently, when the plate 1497 is rotated clockwise, the crank 1508 is moved downwardly to move the picker 1485 downwardly to eject the front card 1483 from its upper position in Fig. 106 until the bottom edge thereof is moved into contact with the feeding roll 1486 and the tension roll 1487, whereupon these rolls grip the card and feed it downwardly into a receptacle in the bottom of the box 1484.

The turning of the shaft 1472 by the motor 1492, therefore, ejects the front clock card 1483 of the employee and automatically spaces the platen 1461 an amount determined by the position to which the lever 1475 has been set.

Just before the end of the operation of the shaft 1472, a finger 1510, integral with the lever 1499, is contacted by a pin 1511 on the plate 1497, which rocks the lever 1499 clockwise against the action of the spring 1501 back to the position shown in Fig. 106, whereby the finger 1498 will be placed in the path of the end of the pawl 1496 and disengage the pawl from the ratchet 1495, and consequently the crank 1508 will receive but one movement down and back for each cycle or operation of the shaft 1472.

It will be recalled that the last operation on the employee's check is the printing of the net pay, which is accomplished by the machine when the operator depresses the Net pay key 162. It is upon the depression of this key that the machine is released and the circuit to the motor 1492 is closed through the operation of the solenoid 1505, the circuit to which is partly closed upon the depression of the Net pay key 162 and is completed immediately after the beginning of the operation of the shaft 150 (Fig. 17), when a pin 1512 on the gear 354 is moved from beneath the toe of a lever 1515 pivoted on a stud 1514 on the right side frame 122. When the lever 1515 is released by the pin 1512, a spring 1516, through a linkage 1517, draws down on a switch 1518 and closes it, thus completing the circuit.

Depression of the Net pay key 162 (Fig. 15) operates a bar 1519 to close a switch 1520 in circuit with the solenoid 1505. When the key 162 is released, a spring 1513 restores the bar 1519 to allow the switch 1520 to open.

The circuit through the motor 1492 and through the solenoid is shown in Fig. 17 and is as follows: from the plus side of the line through conductor 1525, conductor 1526, solenoid 1505, conductor 1527, conductor 1528, through closed switch 1520, thence over line 1529 through the closed switch to the conductor 1530 to the negative side of the line.

When the solenoid 1505 is energized to release the lever 1499, it, by its counter-clockwise movement under the action of the spring 1501, closes switches 1531 and 1532, whereupon the circuit then is completed from the plus side of the line through conductor 1525 and switch 1532, motor 1492, conductor 1533, switch 1531, and thence over line 1534 to negative conductor 1530.

Should the operator wish to eject one or more cards 1483 from the front of the stack without operating the machine, there is provided a bar 1521 (Figs. 1 and 17) mounted on the front of the machine. Depression of this bar 1521 closes a switch 1522 to complete a circuit through the solenoid 1505 to energize it to in turn close the circuit through the motor 1492, described above, to drive the shaft 1472 to actuate the picker 1485. Depression of the bar 1521 completes the following circuit: plus line 1525, line 1526, solenoid 1505, line 1527, line 1523, switch 1522, and line 1524 to negative line 1530. Thus the motor circuit is completed as above described, and the cards 1483 may be ejected one at a time from the stack by the successive depression of the bar 1521

or by holding the bar depressed to keep the circuit closed.

Modified form of check feed by hand

In Figs. 107 and 108 is shown a modified form of feeding mechanism for the check 152 which can be actuated by hand.

This mechanism includes a lever 1535, which may be mounted on a stud 1536 on the printer frame 134 and has pivoted thereto a link 1537, which is pivoted to an arm 1538 fast on the shaft 1078. The previously described slide 1081 has pivoted thereon a spring-operated pawl 1539 adapted to cooperate with teeth 1540, which may be cut in the top side of the bar 1004.

When the lever 1535 is moved to the "Line feed" position, shown in dot-and-dash lines in Fig. 107, the shaft 1078 and the arm 1079 are moved counter-clockwise, whereupon the slide 1081 causes the pawl 1539, through its cooperation with the feed bar 1004, to turn the feed rollers 964 for step-by-step feeding of the check 152.

To feed the check backwardly to the first line, the lever 1535 is moved to the "Back space to first line" position, shown in dot-and-dash lines in Fig. 107, whereupon the slide 1081 is moved to the right, and, in so doing, a plate 1541 (Fig. 108), rigidly secured on the stud 993 and 1082, causes the pawl 1539 to be released from the teeth 1540, and at the same time, the pawls 1043 and 1006 (Figs. 86 and 88) are released from the rack 992 and the bar 1004, so that the spring 1011 can operate the rack 992 to turn the feed rollers 964 counter-clockwise to feed the check 152 backward to the first-line position in the manner described previously.

The complete description of the machine embodying the present invention in connection with the printing of payroll checks 152 and simultaneously printing the data on the summary 151 and on the earnings record 153 has now been completed, and, due to the fact that the operations of the various mechanisms have been fully explained in connection with their detailed descriptions, it is felt that another description of the operation of these mechanisms is not necessary.

Analysis

As has been previously mentioned, the machine embodying this invention is adapted for analysis work for printing on the analysis strip 155 from the hammers 701 to 704 inclusive and for printing on a ticket from the hammers 712 to 717 inclusive.

When it is desired to use the machine for analysis work, the lever 789 (Figs. 1 and 72) may be moved into the "1" or "2" position from the "0" position. When it is moved into the "1" position, "Analysis—Consec. No.," it changes the machine from a payroll writing machine to one which is adapted for analytical work and at the same time controls the consecutive number operating mechanism so that the consecutive number will be printed along with the analysis data. When the lever 789 is moved into the No. 2 or "Analysis—No consec. No." position, the machine is changed from a payroll writing machine into a machine adapted for analytical work, and, at the same time, the lever 789 controls the consecutive number mechanism so that the consecutive number will not be printed on the analysis strip 155 or upon the ticket 156.

The analysis strip 155 is fed from a supply roll 1544, which is simply laid loosely in a receptacle or pocket 1545 located just in front of the hammers 701 to 704 inclusive, which is covered by a lid 1546 pivoted on the hinge 1343. The strip 155 is adapted to be drawn off the supply roll 1544 to the right of the lid 1546 (Fig. 68) and then over the feed rollers 1240 so as to be gripped by the tension rolls 1242, where it is automatically fed one step during each operation of the machine.

The "Analysis" key 164 of row 2 is depressed, and this key is what is known in the art as a "Stay-down" key—that is, it cannot be released by the regular key releasing mechanism—and therefore it can only be released by the usual key release lever 1548 (Fig. 1). The depression of this Analysis key, as has been previously described, by the mechanism shown in Fig. 16 releases the Account No. key and the "W" and the "V" keys 164 for operation by moving the fingers 555 from beneath the key pins 394 of these keys.

The ticket 156 is printed by hammers 712 to 716, which usually print in columns 12 to 17 on the check 152. On this ticket is printed the total of certain types of information that is printed in detail on the analysis strip 155. For example, by referring to Fig. 20, it will be noted that there have been two totals—namely, $723.52 and $245.63—printed on the analysis strip 155, and that, below that, the total $969.15 has been printed in connection with a certain folio number, 4,652, and an account number 236. This account number, folio number, and total amount of $969.15 are printed on the ticket 156. There may be a number of these tickets printed which are used for certain types of sorting work in connection with analysis distributions which are desired by different types of businesses in which this machine is used.

During analysis operations, any amounts which are put into the totalizer corresponding to the "V" key 164 of row 2 are accumulated in the "G. T. 4" totalizer in the zero position of row 4, and any amount which is set up with the "W" key 164 of row 2 depressed will be added into the "G. T. 3" totalizer in the zero position of row 3.

All items entered on analysis are, of course, entered on either or both sides of the amount keyboard by the keys 160 to the left of the split and the keys 161 to the right of the split.

Each item entered will add into its own total and also into the "G. T. 2" total, which, it will be remembered, is in the zero position of row 2. Printing will be made in columns 3 and 4 on the analysis strip 155, and this strip will be fed forwardly after the printing of each item by the feeding pawl 1293 (Figs. 60 and 61).

As has been stated above, a ticket, such as that shown in Fig. 25, may be used with any or all of the item entries.

After all items have been distributed, the accumulated totals may be cleared on the strip 155 in the following manner. To clear the totals in row 4, the operator depresses the "Clear row 4" key 163 and holds this key down, and then successively depresses all keys 166 in row 4.

To clear row 3, the operator depresses the "Clear row 3" key 163 and then successively depresses all keys 165 in row 3. To clear the "G. T. 4" totalizer in row 4, it is necessary to depress the "Clear row 4" key and hold it down and then depress the "V" key 164 in row 2; and to clear the "G. T. 3" totalizer, which is in the zero position in row 3, it is necessary to depress the "Clear row 3" key and then the "W" key 164 in row 2.

It may be desirable to operate the machine to print on a large journal sheet, which may be placed in the machine in place of the summary 151, with no printing media in the record position or the check position, and, in order to do this, it is necessary, of course, to prevent the machine lock arm 919 from locking the machine; that is, from preventing operation of the key release shaft 149 and also of the shaft 628 (Figs. 33 and 34) by preventing operation of the shaft 925 (Fig. 97).

In other words, if the shaft 925 cannot move, then the shaft 149 will not be locked out. Projecting through the cabinet at the left side of the machine is a lever 1550 (Figs. 1, 39, and 72) secured to a yoke 1551, which has integral therewith an arm 1552, all of which are pivoted on a stud 1553 carried by the printer frame 131. The arm 1552 has a finger 1554, which is normally out of the path of movement of an arm 1555, which is secured to the shaft 925, which, it will be remembered, is moved clockwise under the control of the check feeler 858 and the earnings record feeler 859. Therefore, when the shaft 925 is rocked clockwise under control of those feelers, the arm 1555 is moved up in front of the finger 1554, thus preventing any manipulation of the lever 1550, which is normally held in the position shown in Fig. 72 by a spring-operated aliner arm 1556 carrying a pin 1557, which cooperates with two notches in the arm 1552.

However, when it is necessary or desirable to disable the effectivity of the record feeler 858 and the check feeler 859, the lever 1550 is moved counter-clockwise (Fig. 72), whereupon the aliner pin 1557 will engage the lower notch of the arm 1552 and the finger 1554 will be moved upwardly into the path of movement of the arm 1555, which is secured to the shaft 925, and thus prevent any movement of this shaft 925 under control of the feeler arms 936 and 946 and the links 939 and 949 (Figs. 66 and 97) controlled by the record feeler 859 and the check feeler, respectively. Consequently, the shaft 149 cannot be locked by the lock arm 919.

While the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form or embodiment herein disclosed, for it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claimed is:

1. In a machine capable of single-cycle and multiple-cycle operations involved in a complete transaction, a plurality of banks of control keys, certain of which control the machine to make one-cycle operations and the remaining keys control the machine to make multiple-cycle operations; a plurality of differential mechanisms settable under control of the banks of control keys; a plurality of groups of printing means for printing upon a plurality of record materials, said printing means including a plurality of groups of impression means; a plurality of groups of selecting means for said impression means, certain of said selecting means being differentially adjustable by the differential mechanisms; automatic means for adjusting others of said selecting means for causing selective operation of the impression means of the several groups under control of certain banks of keys upon entry of data during certain operations forming a part of a complete transaction; feeding means for each record material for feeding the materials forward and backward; ejecting and inverting means for one of said record materials; a plurality of groups of control means for the feeding means, operable under control of certain banks of keys for feeding a certain plurality of the record materials in either direction, for preventing the feeding of said certain record materials, depending upon the keys which controlled the feeding during the previous operation and for again feeding one of said certain record materials under control of a certain key in another bank of keys; a group of control means controlled by said certain key for feeding said one record material; and another group of control means for causing operation of said ejecting and inverting means under control of said certain key to eject and invert said one record material.

2. In a machine capable of single and multiple-cycle operations involved in a complete transaction, a plurality of banks of control keys, certain of which control the machine to make one-cycle operations and the remaining keys control the machine to make multiple-cycle operations; machine release means; a plurality of differential mechanisms settable under control of the banks of control keys; a plurality of groups of printing means for printing upon a plurality of record materials, said printing means including a plurality of groups of impression means; a plurality of groups of selecting means for said impression means, certain of said selecting means being differentially adjustable by the differential mechanisms; automatic means for adjusting others of said selecting means for causing selective operation of the impression means of the several groups under control of certain banks of keys upon the entry of certain operations forming a part of a complete transaction; feeding means for each record material for feeding the materials forward and backward; ejecting and inverting means for one of said record materials; a plurality of groups of control means for the feeding means operable under control of certain banks of keys for feeding a certain plurality of the record materials in either direction, for preventing the feeding of said certain record materials depending upon the keys which controlled the feed during the previous operation, and for giving an extra feed to a certain one of said certain record materials under control of a certain key in another bank of keys; a group of control means controlled by said certain key for feeding said one record material; another group of control means for causing operation of said ejecting and inverting means under control of said certain key to eject and invert said one record material; and a device associated with each record material and controlled thereby through the absence of its associated record material to prevent operation of the machine release means for a subsequent operation of the machine.

3. In a machine capable of single and multiple-cycle operations involved in a complete transaction, a plurality of banks of control keys, certain of which control the machine to make one-cycle operations and the remaining keys control the machine to make multiple-cycle operations; machine release means; a plurality of differential mechanisms settable under the banks of control keys; a plurality of groups of printing means for printing upon a plurality of record materials, said printing means including a plurality of groups of impression means; a plurality of groups of selecting means for said impression means, certain of said selecting means being differentially adjustable by the differential

mechanism; automatic means for adjusting others of said selecting means for causing selective operation of the impression means of the several groups under control of certain banks of keys upon entry of certain operations forming a part of a complete transaction; feeding means for each record material for feeding the materials forward and backward; ejecting and inverting means for one of said record materials; a plurality of groups of control means for the feeding means under control of certain banks of keys for feeding a certain plurality of the record materials in either direction, for preventing the feeding of said certain record materials, depending upon the keys which controlled the feed during the previous operation and for again feeding one of said certain record materials under control of a certain key in another bank of keys; a group of control means controlled by said certain key for feeding said one record material; another group of control means for causing operation of said ejecting and inverting means under control of said certain key to eject and invert said one record material; a plurality of tension devices, one for each feeding means; a plurality of means adapted to prevent operation of the machine release means; means under control of certain of said tension devices for operating certain of said machine release preventing means; and means controlled by any one, any plurality, and all of said record materials for operating a certain one of said plurality of machine release preventing means upon the absence of any one, any plurality, and all of said record materials to prevent a subsequent operation of the machine.

4. In a machine capable of making single-cycle operations and multiple-cycle operations involving a complete transaction, printing means including a plurality of groups of impression means for printing in columns on a plurality of record materials; a plurality of groups of impression means selecting devices; a plurality of record material feeding devices; a plurality of feed tension devices; a plurality of groups of feed selecting devices; a plurality of feed tension selecting devices; an ejecting and inverting mechanism associated with one of said record materials; a group of selecting devices for the ejecting and inverting means; a plurality of banks of single-cycle control keys to control the selection devices; a bank of multiple-cycle control keys to also control such selection devices; a differential means for each of the single-cycle banks of control keys, each differential being controlled by its associated bank of keys; means associated with the plurality of the banks of single-cycle control keys to control the differential of a certain other bank of single-cycle control keys to actuate said selecting devices as determined by the keys and said associated devices; and a plurality of additional manipulative means to control certain of said selecting means to control certain of said feed tension devices.

5. In a machine capable of making single and multiple-cycle operations involving a complete transaction, printing means including a plurality of groups of impression means for printing in columns on a plurality of record materials; a plurality of groups of impression means selecting devices; a plurality of record material feeding devices; a plurality of feed tension devices; a plurality of groups of feed selecting devices; a plurality of feed tension selecting devices; an ejecting and inverting mechanism associated with one of said record materials; a group of selecting devices for the ejecting and inverting means; a plurality of banks of single-cycle control keys to control the selection devices; a bank of multiple-cycle control keys to also control such selection devices; a differential means for each of the single-cycle banks of control keys, each differential being controlled by its associated bank of keys; means associated with the plurality of the banks of single-cycle control keys to control the differential of a certain other bank of single-cycle control keys to actuate said selecting devices as determined by the keys and said associated means; a plurality of additional manipulative means to control certain of said selecting devices to control certain of said feed tension devices; machine releasing means; a plurality of locking devices for the machine releasing means; means associated with each of said record materials and controlled by the absence of any one, any plurality, or all of said record materials for operating one of said locking devices; and means operated by said manipulative devices which control said feed tension selecting devices to operate either of the other of said locking devices when its associated tension device is out of effective position.

6. In a machine capable of making single-cycle and multiple-cycle operations involving a complete transaction, printing means including a plurality of groups of impression means for printing in columns on a plurality of record materials; a plurality of feeding means for said record materials; an ejecting and inverting means associated with one of said record materials; a tension device associated with each of said feeding means; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; a machine releasing means; a plurality of locking devices for the machine releasing means, any one of which when operated will prevent operation of the machine releasing means; a plurality of feeling devices associated with said record materials; and a control line including a plurality of groups of adjustable control plates, each plate in each group adapted to be individually adjusted, the several differential adjustments of the plates of the control line being under control of said plurality of banks of keys, said single banks of keys, said feeling devices, and said tension devices, to control the printing by the groups of impression means in all columns on all record materials, to control the feeding of all record materials, to control the ejection of one of said record materials, to control the operation of a certain one of said machine release locking devices by any one of said feeler devices, and to control the operation of the other locking devices under control of the tension devices associated therewith.

7. In a machine capable of making single-cycle and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on the record material and in certain lines of designated spaces in those columns; feeding means for said record material adapted to feed said record material forwards and backwards; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; and feed control devices operable under control of all banks of keys for operating said feeding mechanism to feed said record material forwardly under control of certain keys of said banks when the previous printing occurred in one line of said space on the record material and for

preventing the operation of said feeding means when the previous printing was on the same line under control of said certain keys.

8. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on the record material, and in certain lines of designated spaces in those columns; feeding means for the record material adapted to feed said record material forwards and backwards; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; and feed control devices operable under control of all banks of keys for operating said feeding mechanism to feed said record material forwardly under control of certain keys of said banks when the previous printing occurred in one line of said space on the record material and for preventing the operation of said feeding means when the previous printing was on the same line as determined by said certain keys, and for feeding said record material backwards under control of certain of said keys in all banks, depending upon the position in which the last printing occurred.

9. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on the record material, and in certain lines of designated spaces in those columns; feeding means for said record material, adapted to feed said record material forwards and backwards; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; and feed control devices operable under control of all banks of keys for operating said feeding mechanism to feed said record material forwardly under control of certain keys of said banks when the previous printing occurred in one line of said space on the record material and for preventing the operation of said feeding means when the previous printing was on the same line as determined by said certain keys, for feeding said record material backwards under control of certain of said keys in all banks, depending upon the position in which the last printing occurred, and for feeding said record material forwardly to receive printing in a certain line of the succeeding space upon the operation of a certain key in the bank of keys which controls the machine for multiple-cycle operations.

10. In a machine capable of making single- and multiple-cycle operations, involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material; feeding means for feeding the record material forwards and backwards so that printing may be made in the top line and the bottom line of the same space on the record material; a plurality of banks of keys to control the machine for single-cycle operations; a bank of keys to control the machine for multiple-cycle operations; and means controlled by all of said banks of keys for controlling the feeding mechanism to select the top or the bottom line of the space to be printed upon, depending upon the key operated.

11. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material; a plurality of banks of single-cycle control keys to select the line of the space to receive the printing during single-cycle operations; and a bank of multiple-cycle control keys to select the line of the same space to receive the printing during multiple-cycle operations.

12. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material; a plurality of banks of single-cycle control keys to select the line of the space to receive the printing during single-cycle operations; and a bank of multiple-cycle control keys to select the line of the same space to receive the printing during multiple-cycle operations and to select a certain line in the succeeding space for a subsequent operation when a certain key of said multiple-cycle bank is operated.

13. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material; a plurality of banks of single-cycle control keys to select the line of the space to receive the printing during single-cycle operations; and a bank of multiple-cycle control keys to select the line of the same space to receive printing during multiple-cycle operations, and also to select a certain line in the succeeding space for a subsequent single-cycle operation when a certain key of said multiple-cycle bank is operated.

14. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material; control means to control the feeding means to select the line of the space to receive the printing during single-cycle operations; a bank of single-cycle control keys to control said control means; control means to control the feeding means to select the line of the space to receive the printing during multiple-cycle operations; and a bank of multiple-cycle control keys to control the last-mentioned control means.

15. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material; control means to control the feeding means to select the line of the space to receive the printing during single-cycle operations; a bank of single-cycle control keys to control said control means; differential means to operate said control means as determined by said single-cycle control keys; a second control means to control the feeding means to select the line of the same space to receive the printing during multiple-cycle operations; a bank of multiple-cycle control keys to control said second-mentioned control means; and differential means to operate said

second-mentioned control means as determined by said multiple-cycle control keys.

16. In a machine capable of making single- or multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material; a plurality of banks of single-cycle control keys to select the line of the space to receive the printing during single-cycle operations; control means operable under control of said banks of single-cycle keys to control the feeding means; a bank of multiple-cycle control keys to select the line of the same space to receive the printing during multiple-cycle operations and to select a certain line in the succeeding space for a subsequent operation when a certain key of said multiple-cycle bank is operated; and control means operable under control of said bank of multiple-cycle keys to control the feeding means.

17. In a machine capable of making single- and multiple-cycle operations including a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; and feeding means for said record material, including feed rollers and a plurality of driving means, a certain one of which operates said rollers to feed the record material to receive printing in the proper line of one space, another one of which operates said rollers to feed the record material to receive printing in the bottom line of the same space, and a third one of which operates said rollers to feed the record material to receive printing in the top line of the succeeding space.

18. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on the record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feed rollers; a plurality of driving means, a certain one of which operates said rollers to feed the record material to receive printing in the top line of one space, another one of said driving means operates said rollers to feed the record material to receive printing in the bottom line of the same space, and a third one of said driving means operates said rollers to feed the record material to receive printing in the top line of the succeeding space; a plurality of banks of single-cycle control keys to control the first two driving means; and a bank of multiple-cycle keys to also control the first two driving means upon the operation of certain keys and to also control the third driving means upon the operation of a certain other key in said bank.

19. In a machine capable of making single-cycle and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feeding rollers; a plurality of driving means, a certain one of which operates said rollers to feed the record material to receive printing in the top line of one space, another of said driving means operates said rollers to feed the record material to receive printing in the bottom line of the same space, and a third one of said driving means operates said rollers to feed the record material to receive printing in the top line of the succeeding space; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; and a plurality of groups of control plates, the plates of one group being controlled by a certain key of the bank of multiple-cycle keys to control the operation of the third driving means, and the plates of another group being controlled by the keys of the single-cycle banks and certain other keys of the multiple-cycle bank, to control the operation of the first two driving means.

20. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feeding rollers; a plurality of driving means, a certain one of which operates said rollers to feed the record material to receive printing in the top line of one space; means to prevent operation of the feed rollers by said one driving means when the printing in the preceding operation is in said top line of said one space; another one of said driving means operates said rollers to feed the record material to receive printing in the bottom line of the same space; means to prevent operation of said another one of the driving means when the printing in the preceding operation is in said bottom line of said same space; and a third one of said driving means operating said rollers to feed the record material to receive printing in the top line of the succeeding space.

21. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feed rollers adapted to feed the record material forwards and backwards; and a plurality of driving means, a certain one of which operates said rollers to feed the record material forward to receive printing in the top line of one space when the printing in the preceding operation occurred in the botom line of said space, another one of said driving means operating said rollers to feed the record material backwardly to receive printing in the bottom line of the same space when in the preceding operation the printing occurred in the top line of said space, and a third one of said driving means operating said rollers to feed the record material to receive printing in the top line of the succeeding space.

22. In a machine capable of making single- and multiple-cycle operations, involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material including feed rollers adapted to feed the record material forwards and backwards; a plurality of driving means, a certain one of which operates said rollers to feed the record material backward to

receive printing in the top line of one space when the printing in the preceding operation occurred in the bottom line of said space, another one of said driving means operating said rollers to feed the record material forwardly to receive printing in the bottom line of the same space when in the preceding operation the printing occurred in the top line of said space, and a third one of said driving means operating said rollers to feed the record material to receive printing in the top line of the succeeding space; a plurality of banks of single-cycle control keys to control the forward and backward feeding of the record material by the first two mentioned driving means; and a bank of multiple-cycle keys to also control the first two mentioned driving means to control the forward and backward feed of the record material when certain keys of this multiple-cycle bank are operated, and to also control the third driving means when a certain one of the keys in this multiple-cycle bank are operated.

23. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feeding rollers; a plurality of driving means for operating said feed rollers to feed the record material forwards and backwards; a single member carrying all of said driving means; operating means for the single member to move all driving means in the operating direction at the same time; a plurality of members for cooperating with said driving means to determine the effectivity of the same upon operation of the common carrying means; and means under the control of a plurality of banks of single-cycle control keys and a bank of multiple-cycle control keys for controlling the operation of said members.

24. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feed rollers; a plurality of drive means to operate said feed rollers to feed the record material forwards and backwards to select the top line and the bottom line of any one space and to select the top line of the succeeding space to receive printing; a single member carrying all of said driving means; operating means for said single member to move the driving means in the operative direction during each operation of the machine; and a plurality of devices cooperating with said driving means to determine the effectivity of the same when moved in the driving direction by the common carrying member.

25. In a machine capable of making single- and mutiple-cycle operations, involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feed rollers; a plurality of drive means to operate said feed rollers to feed the record material forwards and backwards to select the top line and the bottom line of any one space, and to select the top line of the succeeding space to receive printing; a single member carrying all of said driving means; operating means for said single member to move the driving means in the operative direction during each operation of the machine; a plurality of devices cooperating with said driving means to determine the effectivity of the same when moved in the driving direction by the common carrying member; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; and a plurality of differentially adjustable control means operable under control of said banks of control keys to control the operation of said devices.

26. In a machine capable of making single- and multiple-cycle operations, involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feed rollers adapted to feed the record material forwards and backwards; a plurality of driving means for said feed rollers; a single member carrying all of said driving means; operating means for said single member for moving the driving means in the operative direction; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; a plurality of devices for controlling all of said driving means to cause a certain one of said driving means to feed the record material forwardly from the top line to the bottom line in said space upon the operation of certain keys in the single-cycle banks; means for preventing operation of said feeding means forwards by said driving means when any one of said certain keys was operated during the previous operation of the machine; means operated by certain other keys of said banks of single control keys for feeding the record material backwardly by another of said driving means; means for preventing operation of the driving means in a backward direction by said second driving means when any one of said certain other keys was operated during the previous operation of the machine; means operable under control of all of said keys of said single-cycle control banks to control one of said devices to prevent operation of the feeding means in a forward direction by a third one of said driving means; means for preventing operation of said third driving means by certain keys of the multiple-cycle control bank; and means under control of a certain one of said keys in the multiple-cycle control bank for controlling said devices to render said third driving means effective to operate the feed rollers to feed the record forwardly from the bottom line of one space to the top line of the succeeding space.

27. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of printing means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for said record material, including feed rollers; a plurality of driving means, a certain one of which operates said rollers to feed the record material to receive printing in the top line of one space; a second one of which operates said rollers to feed the record material to receive printing in the bottom line of the same space; and a third one of said driving means operates the rollers to feed the

record material to receive printing in the top line of the succeeding space; a single member carrying all of said driving means; and operating means for said single member for moving all of the driving means in the operative direction to turn the feed rollers to feed the record material forwardly when operated by the second one of said driving means to operate the feed rollers to feed the record material forward to receive printing in the bottom line of a space when the preceding print was in the top line of the same space, and for operating the first one of the driving means to move the feed rollers to feed the record material backwardly to the top line of the same space when the previous printing was in the bottom line of the same space, and to operate the third one of the driving means to feed the record material forwardly to bring the top line of the succeeding space into printing position.

28. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material, said columns having spaces to receive printing in the top line and in the bottom line of each space; feeding means for feeding said record material forwardly and backwardly, including feed rollers; a plurality of driving means for operating the feed rollers forwardly and backwardly to receive printing in the top and bottom lines of a space, and in the bottom and top lines of the space, depending upon where the preceding print occurred, and to feed the record material forwardly to receive a printing in the top line of a succeeding space; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; and devices cooperating with said driving means and operable under control of the keys in the single-cycle banks and certain of the keys in the multiple-cycle banks for controlling the driving means to feed the record material forwardly and backwardly to receive printing in the top and bottom, and bottom and top lines of a single space, and to control said driving means under control of a certain key in the multiple-cycle bank to feed the record material to receive the next impression in the top line of the succeeding space.

29. In a machine capable of making single-cycle and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material; feeding means for feeding the record material forwardly and backwardly to receive the various printing impressions involving a complete transaction; a plurality of banks of single-cycle control keys; a bank of multiple-cycle control keys; means under control of the single-cycle banks of keys for controlling the feeding means to feed the record material successively in a forward direction; means under control of a certain one of the keys in the multiple-cycle control bank to cause the feeding means to feed the record material backwardly; means under control of a second key in the multiple-cycle bank for controlling the feed means to feed the record material to a definite position; ejecting and inverting means for the record material; means for moving the ejecting mechanism into position to receive the record material during the operation of the printing of the first item of the complete transaction; and means for disabling all of the feeding means and releasing the ejecting means to eject the record material upon the operation of the second one of said keys of the multiple-cycle control bank.

30. In a machine capable of making single- and multiple-cycle operations involving a complete transaction, printing means including a plurality of impression means for printing in columns on record material; feeding means including a plurality of driving devices for feeding the record material forwardly and backwardly to receive the various impressions of the multiple-operation transaction; ejecting mechanism for the record material; a plurality of single-cycle banks of control keys; a bank of multiple-cycle control keys; means operable during the operation of the first single-cycle control key to move the ejecting mechanism into position to receive the record material so that it may eject the same after the completion of the printing of the several items of the several operations involving the complete transaction; and means for rendering all of the driving devices ineffective and for causing operation of the ejecting means to eject the record material during a multiple-cycle operation under control of a certain one of the keys in the multiple-cycle bank.

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Certificate of Correction

Patent No. 2,467,704. April 19, 1949.

PASCAL SPURLINO ET AL.

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 26, line 45, for "numebered" read *numbered*; column 79, line 11, for the reference letter "K" before "keys" read *G*; column 82, line 12, for the word "form" read *from*; column 93, line 29, for "stud" read *studs*; column 97, line 60, for "devices" after "associated" read *means*; line 61, for "means" after "manipulative" read *devices*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of October, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.