

Sept. 10, 1957

P. SPURLINO ET AL  
 ACCOUNTING MACHINE WITH TOTALIZER CONTROLLED, DIFFERENTIALLY  
 POSITIONABLE, BOOKKEEPING CHART

2,805,821

Filed Dec. 3, 1951

13 Sheets-Sheet 1

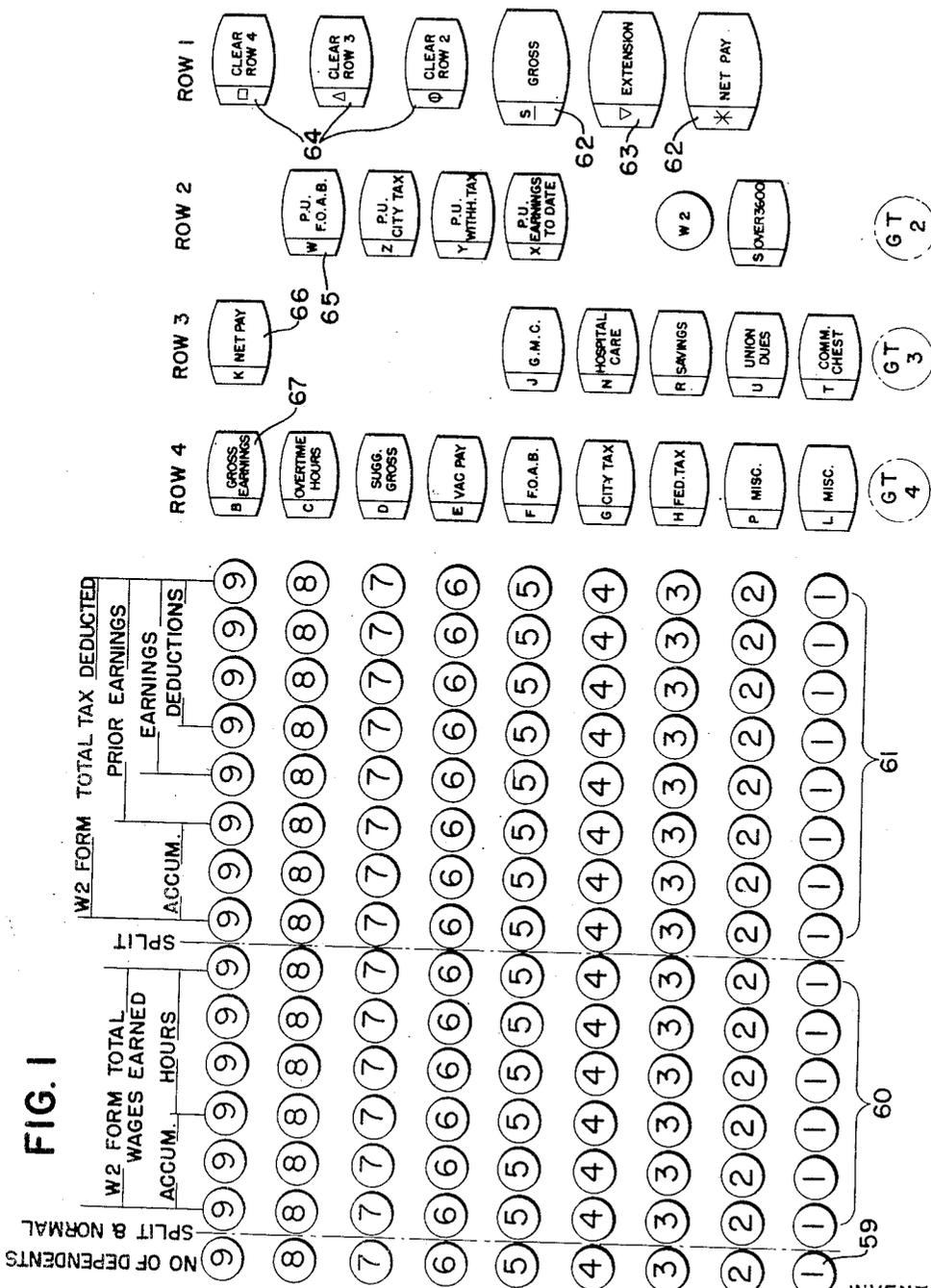


FIG. 1

INVENTORS  
 PASCAL SPURLINO  
 ROGER S. HULL JR  
 MARVIN D. FROST

BY *Earl Bennett*  
*Ayres W. Stoddard*

THEIR ATTORNEYS

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13 Sheets-Sheet 2

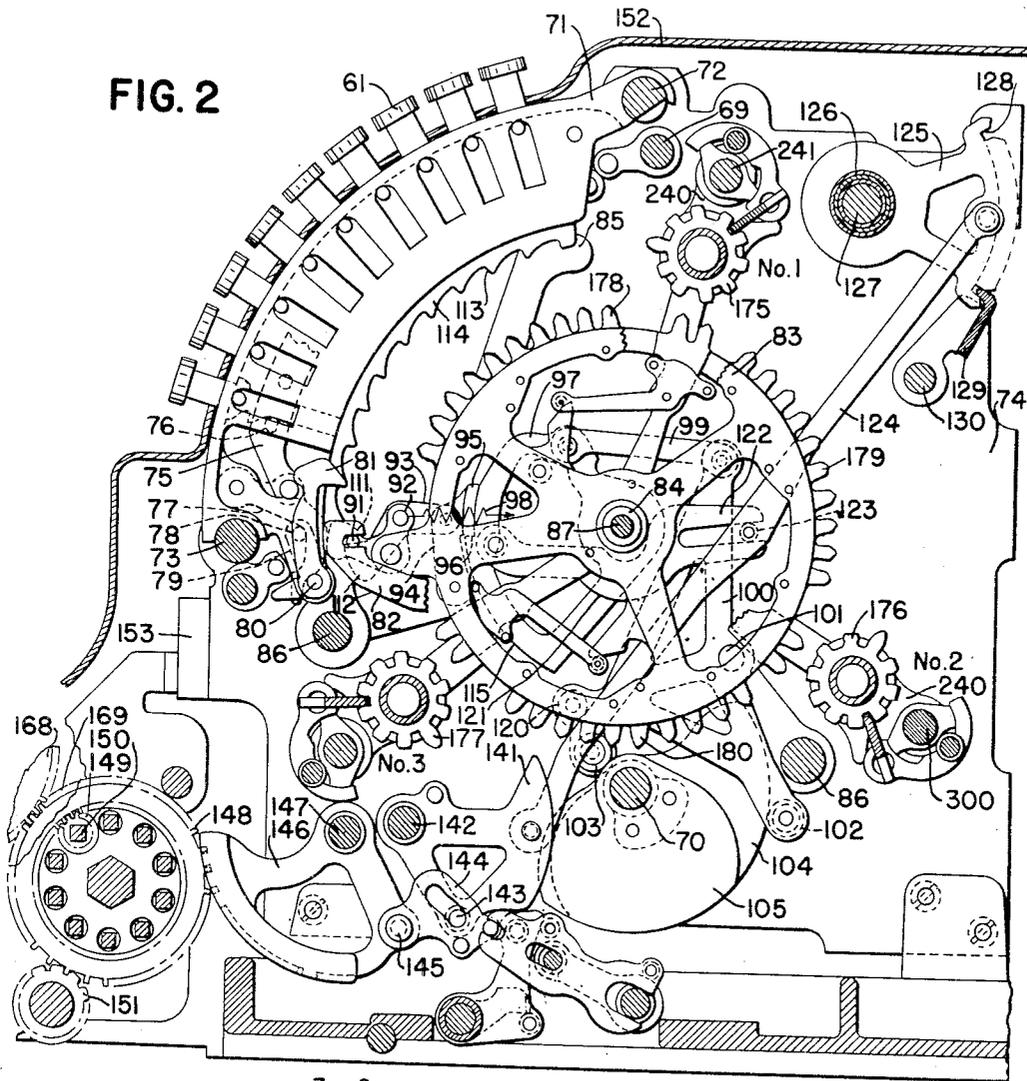


FIG. 2

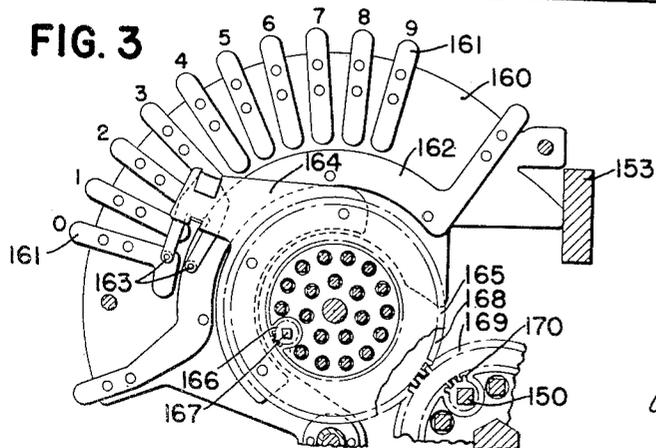


FIG. 3

INVENTORS  
PASCAL SPURLINO  
ROGER S. HULL &  
MARVIN D. FROST

BY *Carl Beust*  
*Ayres H. Stoddard*  
THEIR ATTORNEYS



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FIG. 8

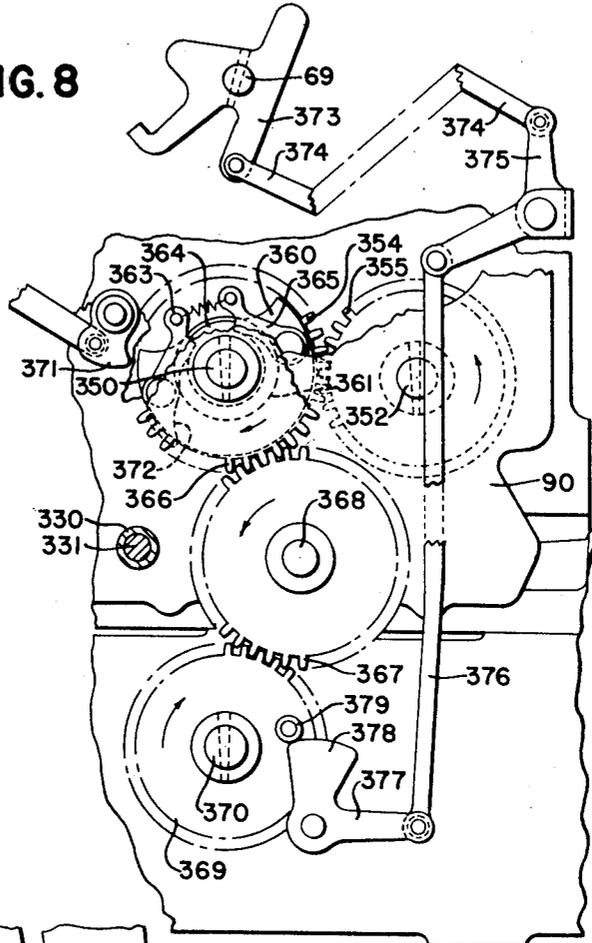
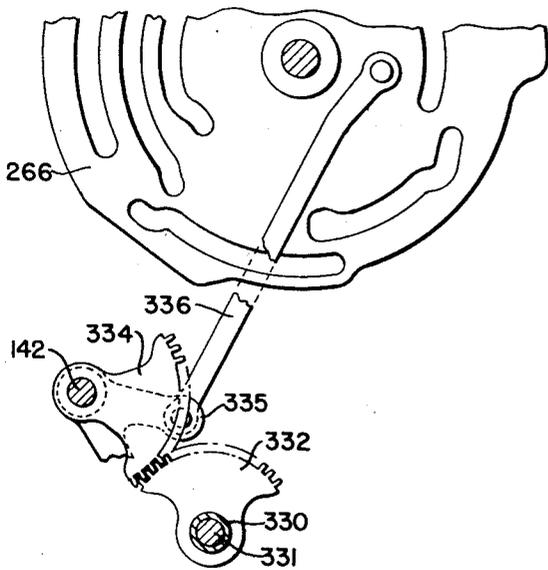


FIG. 9



INVENTORS  
PASCAL SPURLINO  
ROGER S. HULL &  
MARVIN D. FROST

BY *Carl Brist*  
*Ayres H. Stoddard*

THEIR ATTORNEYS.





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FIG. 15

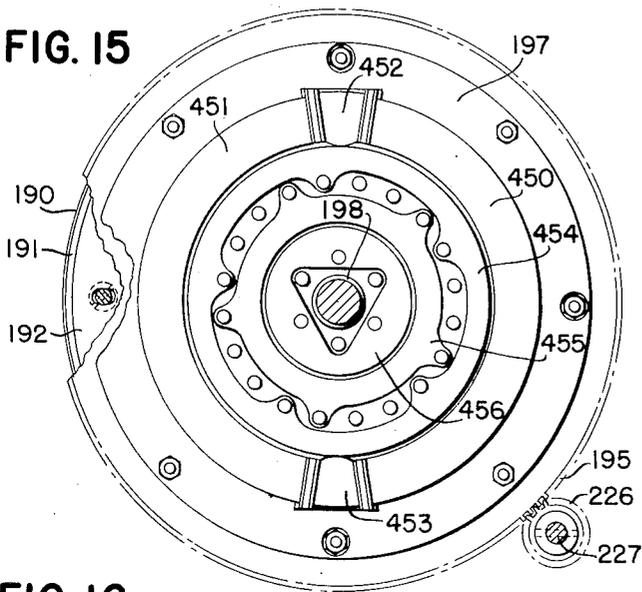
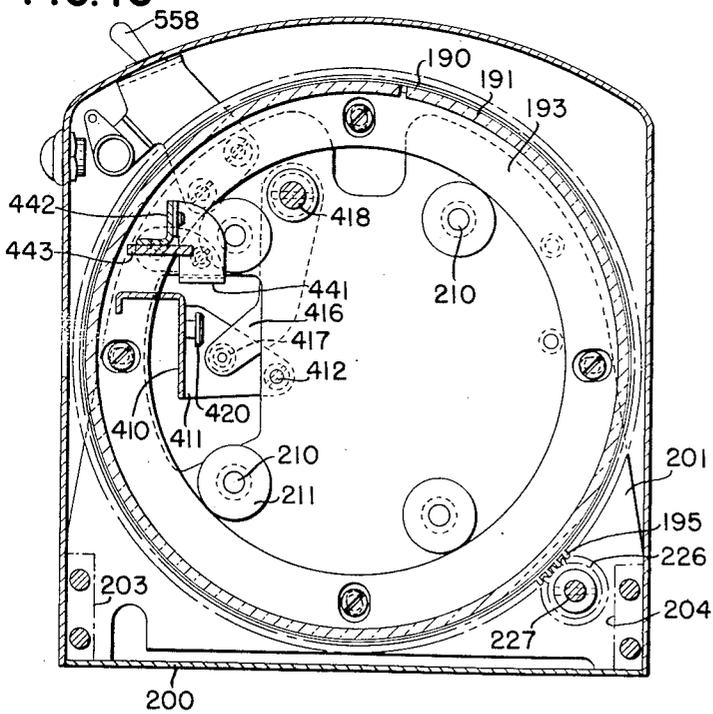


FIG. 16



INVENTORS  
PASCAL SPURLINO  
ROGER S. HULL &  
MARVIN D. FROST

BY *Carl Best*

*Ayres H. Stoddard*

THEIR ATTORNEYS

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FIG. 17

EXPLANATION OF CODE LETTERS		BALANCES	
EARNINGS	DEDUCTIONS	W - O.A.B.	X2,540.25
B - REGULAR	F - O.A.B.	Y - EARNINGS	413.50
C - OVERTIME	G - CITY TAX	Z - U.S. INC. TAX	12.70
D - SUGG.	H - FED. TAX	W - CITY TAX	38.10
E - VACATION	I - MISC.	N - COMM. CHEST	85.88
	J - MISC.	R - UNION DUES	3.00
HOURS	EARNINGS	DEDUCTIONS	BALANCES
40.00	B 116.00	F 1.74	X2,540.25
	116.00	G .58	Y 413.50
		H 18.80	Z 12.70
		I 2.00	W 38.10
		J 4.00	N 85.88
		K 3.00	R 3.00

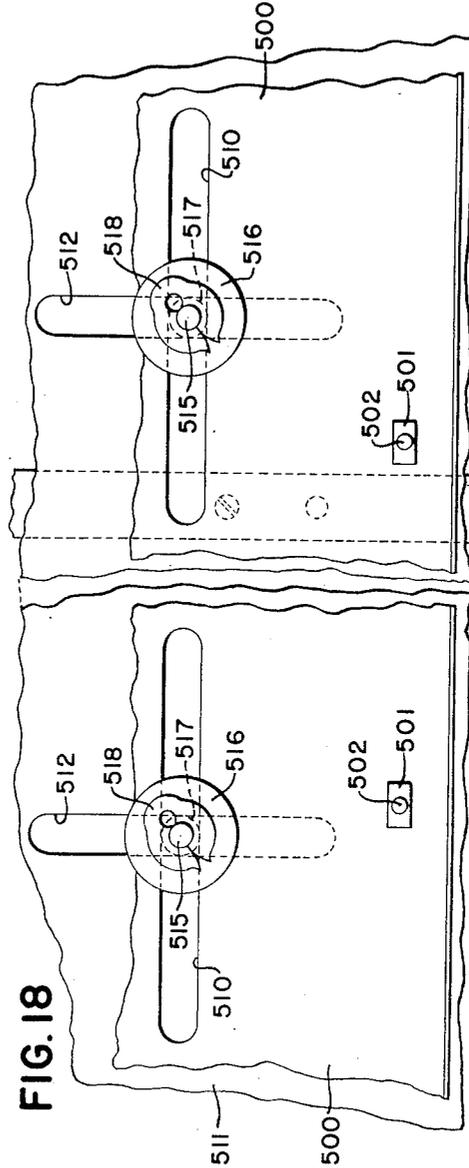
  

45-3 RICHARD ROE	302-15-3186 OD	
	PER END 7-19-47	
	THE JOHN DOE CO.	

FACTORY PAYROLL CHECK	
THE JOHN DOE CO.	
CHECK NUMBER	854677 JAN
PAY	\$☆☆☆85 AND 88 CENTS
TO THE ORDER OF	302-15-3186 OD
	45-3 RICHARD ROE
	ANY BANK OR TRUST CO.
	ANYWHERE

FIG. 18



INVENTORS  
 PASCAL SPURLINO  
 ROGER S. HULL &  
 MARVIN D. FROST

BY *Earl Beust*

*Agnes R. Stoddard*

THEIR ATTORNEYS



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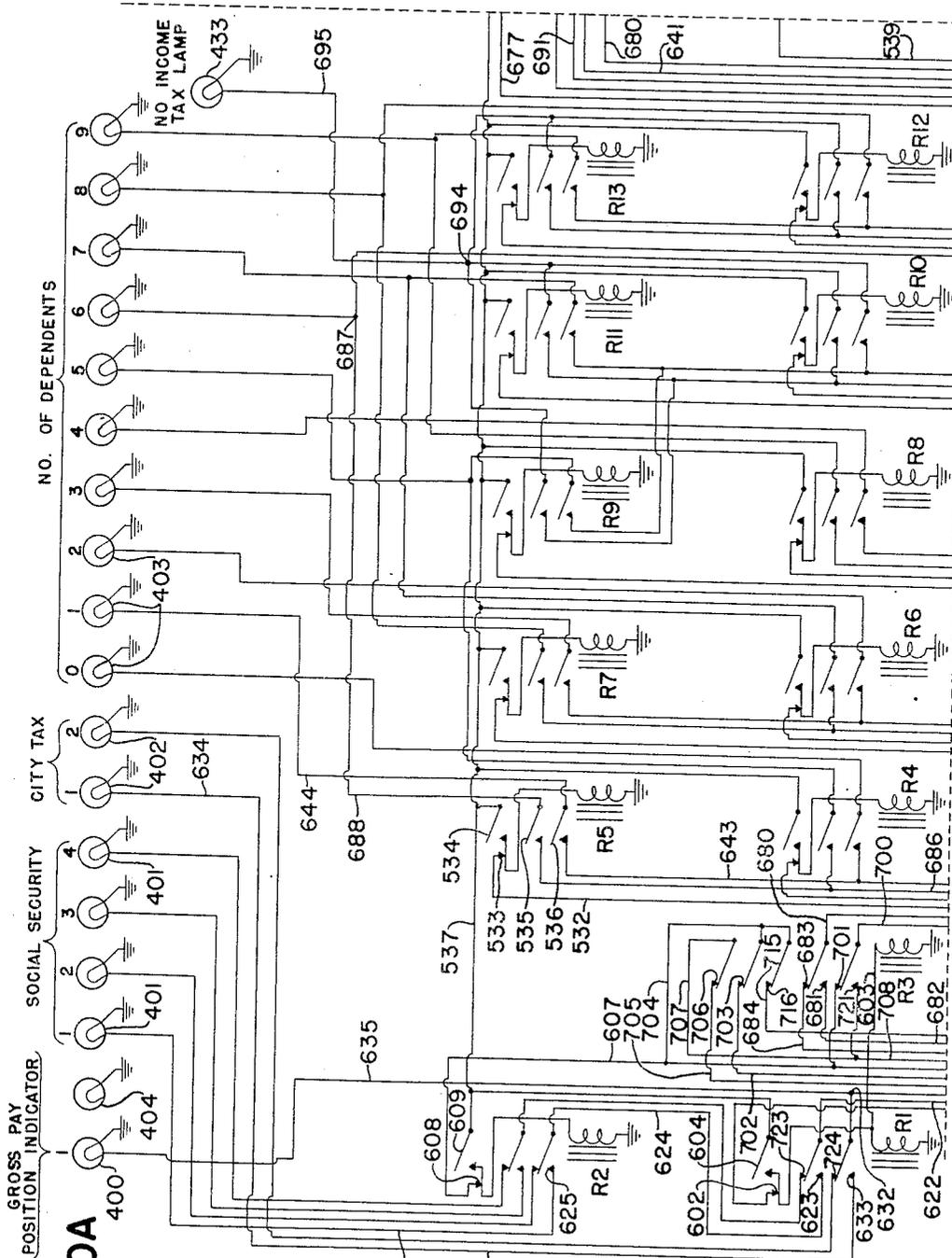


FIG. 20A

INVENTORS  
PASCAL SPURLINO  
ROGER S. HULL &  
MARVIN D. FROST

BY *Harold Bess*  
*Agnes H. Stoddard*

THEIR ATTORNEYS

Sept. 10, 1957

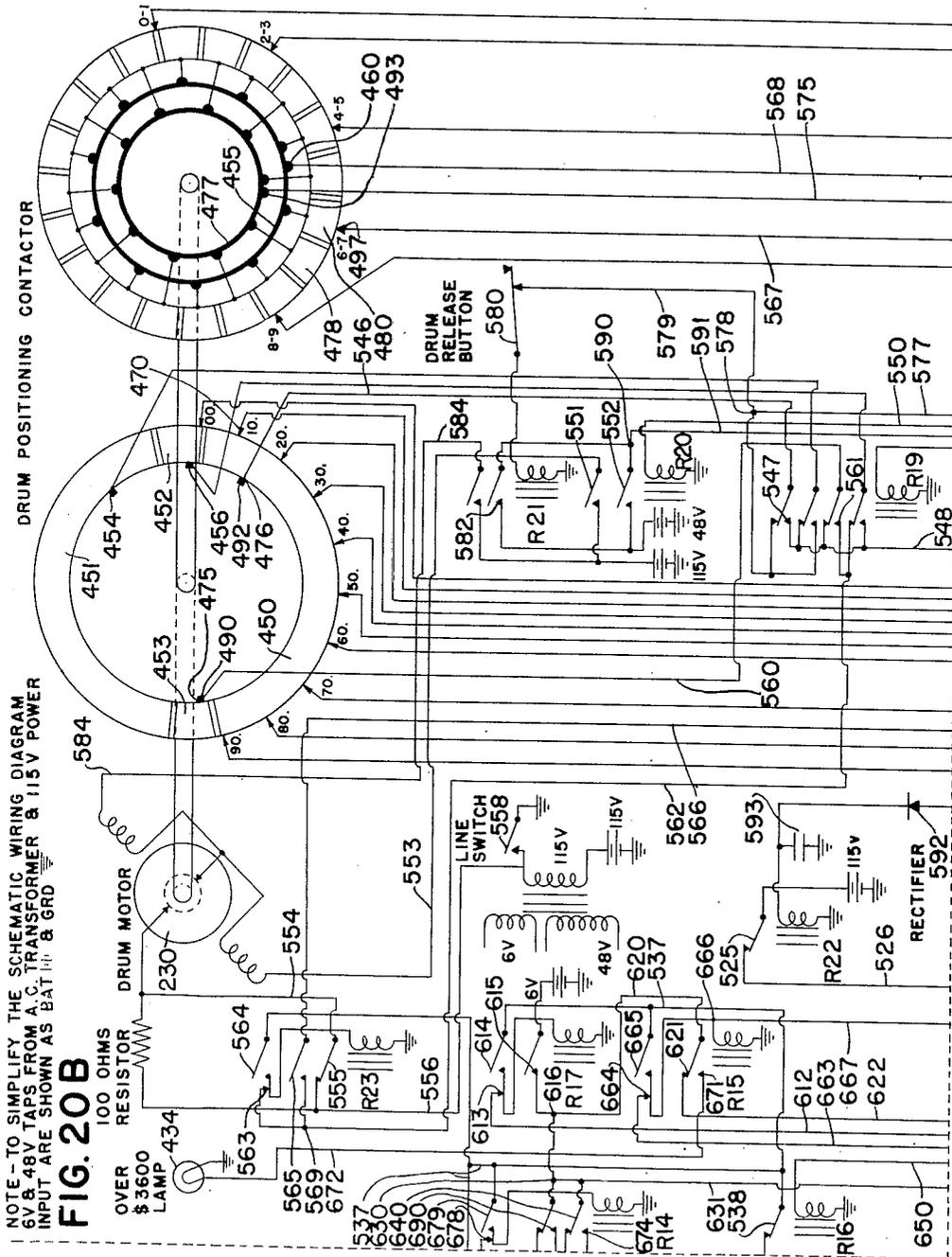
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P. SPURLINO ET AL

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2,805,821

13 Sheets-Sheet 11



INVENTORS  
PASCAL SPURLINO  
ROGER S. HULL &  
MARVIN D. FROST

BY *Carl Best*  
*Clyde H. Stoddard*

THEIR ATTORNEYS

Sept. 10, 1957

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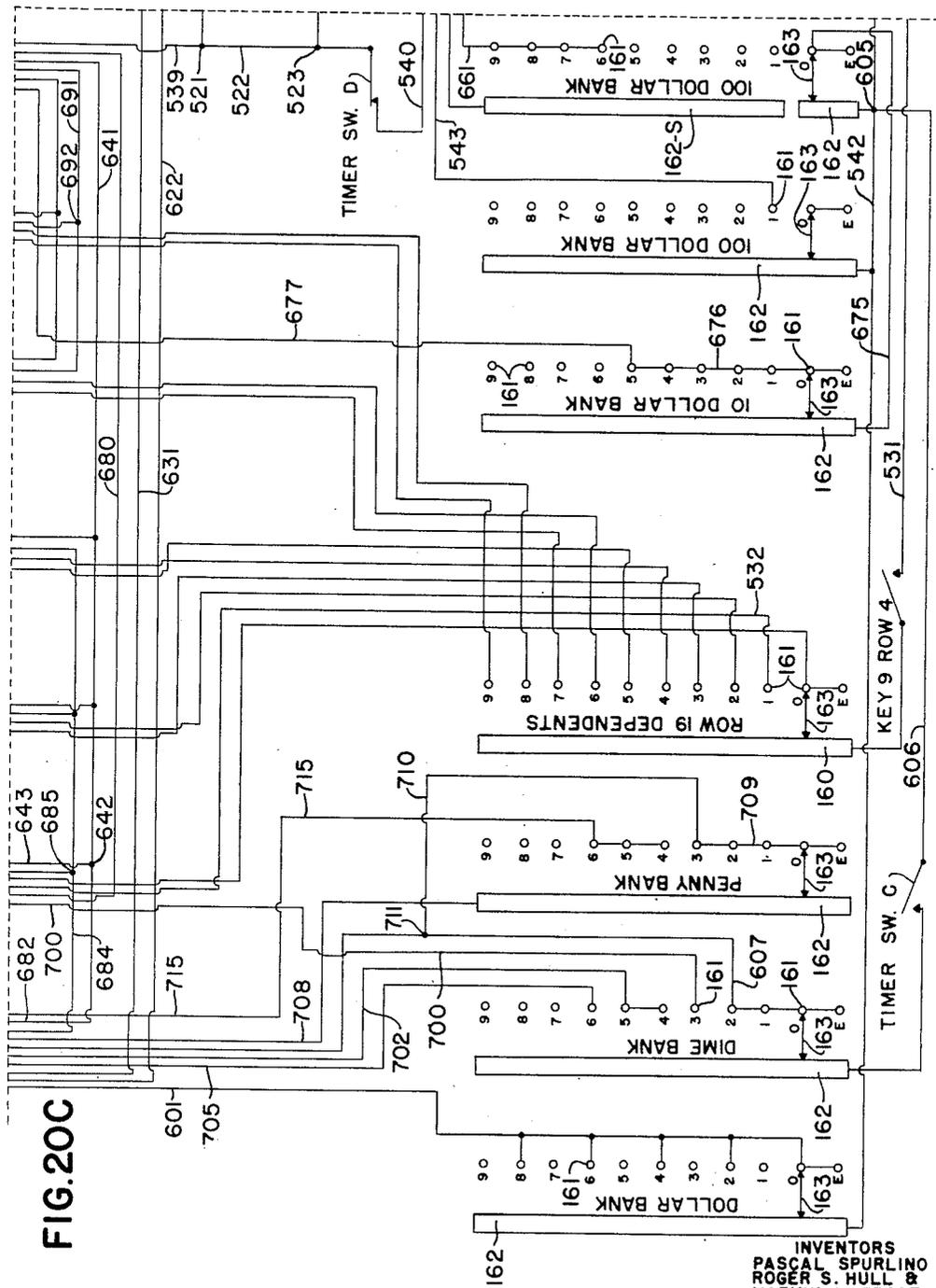


FIG. 20C

INVENTORS  
PASCAL SPURLINO  
ROGER S. HULL &  
MARVIN D. FROST

BY *Earl Beust*  
*Agnes R. Stoddard*

THEIR ATTORNEYS

Sept. 10, 1957

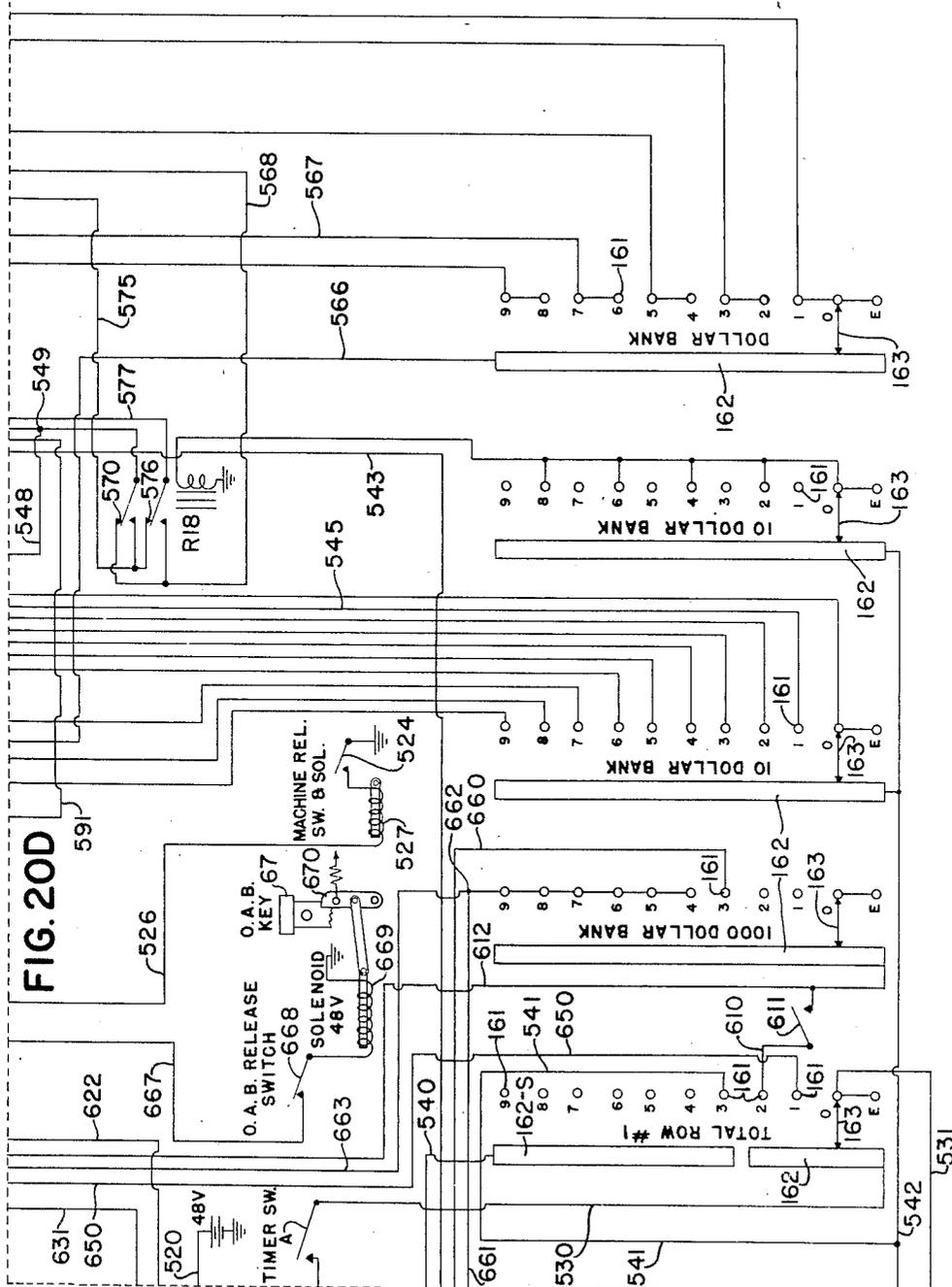
P. SPURLINO ET AL

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Filed Dec. 3, 1951

13 Sheets-Sheet 13



INVENTORS  
PASCAL SPURLINO  
ROGER S. HULL &  
MARVIN D. FROST

BY *Harold Beust*  
*Agnes R. Stoddard*  
THEIR ATTORNEYS

1

2,805,821

**ACCOUNTING MACHINE WITH TOTALIZER CONTROLLED, DIFFERENTIALLY POSITIONABLE, BOOKKEEPING CHART**

Pascal Spurlino, Roger S. Hull, and Marvin D. Frost, Dayton, Ohio, assignors to The National Cash Register Company, Dayton, Ohio, a corporation of Maryland

Application December 3, 1951, Serial No. 259,574

20 Claims. (Cl. 235—2)

This invention relates to accounting machines and similar business machines and is directed particularly to means for speeding up the recording of payroll data and the consequent printing of the payroll checks, and to control various mechanisms in the machine in this connection.

Briefly, the present invention includes what might well be termed an automatic tax indicating device. The present invention is a remarkable time-saving development in connection with accounting machines particularly used in writing payrolls, for the following reasons. The invention herein illustrated and described automatically indicates variable tax or other deductions based on a fixed percent of gross earnings. The invention automatically controls over-deduction of F. O. A. B. or federal insurance contributions. It reduces the payroll processing to a figuring of base and other pays, which are put together to form an employee's gross pay.

It eliminates pre-computation of gross earnings, as above mentioned, because all of these base and other pays are entered into the machine and the machine automatically computes these amounts. The invention eliminates weekly pressure peaks and unnecessary overtime cost in the payroll departments. It reduces the time interval between the end of a pay period and the beginning of the payroll writing period.

All of these result in a high production of payroll writing, which naturally cuts costs to a minimum. For example, the automatic tax indicator, which, as above mentioned, is a part of this present invention herein shown and described, simultaneously shows the correct amounts to be deducted for F. O. A. B., for social security, and for city and federal income taxes, which deductions are based on a fixed percentage of gross earnings, and these amounts are illuminated, so that the operator always makes the proper deductions from the employee's gross pay.

When the earnings-to-date for the year exceeds the maximum taxable limit, no F. O. A. B. or social security tax is indicated, and the F. O. A. B. key cannot be operated and a red light appears to indicate to the operator that no further deductions for social security should be made against this particular employee.

When current earnings are less than the minimum taxable limit, no withholding tax is indicated, and the operator is so apprised of that fact by the appearance of a green light. The automatic tax indicator may be conveniently adjusted to the operator's line of vision.

This invention is especially adapted to be used in machines of the payroll type, shown and described in United States Patent No. 2,467,704, issued April 19, 1949, to Pascal Spurlino, Rudolph J. Moser, Alfred G. Kibler, Marvin D. Frost, and Walter J. Kreider, and for illustrative purposes is embodied in a machine of the type shown in said patent.

This invention is also embodied in machines of the general type shown in the following United States Letters Patent, and reference may be had to them and to the

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above-mentioned patent for a complete showing and description of standard mechanism 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; No. 2,305,000, issued December 15, 1942, to Mayo A. Goodbar; No. 2,361,662, issued October 31, 1944, to Pascal Spurlino and Konrad Rauch; No. 2,345,839, issued April 4, 1944, to Pascal Spurlino, Mayo A. Goodbar, and Marvin D. Frost; and No. 2,351,541, issued June 13, 1944, to Everett H. Placke.

The specific mechanism shown in the above-mentioned Patent No. 2,467,704, embodying the present invention and as now constructed, is well adapted for use in 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 payments, city income tax withholdings, federal income tax withholdings, union dues, hospitalization, and many other types of deductions, which various organizations permit their employees to make against gross earnings for a definite period. Accurate records of each of the various types of individual deductoins 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, and also the totals of the net earnings of the employees, the gross earnings of the employees, and other records relative 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 at any time definitely ascertain by means of printed records the number of 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 the consecutive number, the date, and the net amount of the check printed in two places; and on the 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 worked, the gross earnings for those regular hours, a list of all deductions, showing the amount of each, a symbol for each deduction, and the net pay. The net pay, 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.

The machine in which the present invention is embodied is also adapted to print upon a payroll summary sheet, which may be used, for example, for the departmental summary of the employees in any one or more departments. If the departments are too large the payroll summary may be allotted to various jobs of the departments.

An individual employee's earnings record card may also be printed by the machine in which this present invention is embodied. Upon this earnings card, which is divided into columns, there may be printed the number of regular hours the employee works and the gross amount of earnings for the regular hours. The deductions against each employee are also printed and recorded on this particular earnings record card for the individual employee.

In the last column on the card, there is a space for a Balance Forward, which is picked up from a former earnings record, set up on the keyboard, and printed in this

column, when a new record card is begun for the employee when his old card is filled.

On the top of the machine, there is provided a time card box, which carries the time cards for each individual employee. On these time cards there is various data, relating particularly to the number of regular hours and the number of overtime hours which the employee has worked. On this card 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 operation of the Net Pay key.

The control of the ejection of the time clock cards, when used in connection with the payroll machines, is specifically illustrated and described in an application for Letters Patent of the United States filed November 21, 1950, by Angus G. Helgeson, and bearing Serial Number 196,906, which issued into United States Patent No. 2,682,993 on July 6, 1954.

Mounted on top of the machine and to the left of the time card box is an automatic tax indicator device. This tax indicator device includes a chart of constant figures, which chart is mounted on a rotatable drum, the drum being rotated under control of certain differential mechanisms which in turn are controlled by the totalizer wheels of the crossfooter when the Gross key in row 1 is depressed. The depression of this key causes a subtotal operation of the employee's gross pay, which has been accumulated in this crossfooter during the operations of entering the regular Gross pay, and, in addition, any overtime pay or bonus pay which the employee has earned.

On this chart there are several columns of figures, which indicate taxes of various kinds; namely, F. O. A. B., city income taxes, and federal income taxes, according to the number of dependents the employee has and according to the amount of gross pay of such employee. In the first column, the gross pays are printed to indicate a \$2.00 range in pay.

The social security or F. O. O. B. taxes are in four columns and are divided according to the amount of money in cents that the man makes; in other words, from zero to 33 cents the figures are in one column, from 34 cents to 99 cents in another column, and from \$1.00 to \$1.66 in a third column; and from \$1.67 to \$1.99 on the gross pay there is a fourth column. The city income tax figures are in two columns, based on odd dollar ranges of \$2.00; i. e., at each \$5.00, \$7.00, \$9.00, etc., the tax, at the rate of one half of one percent, increases one cent. The federal income tax figures are based on the number of dependents that a man has, running from no dependents to nine dependents.

Behind these various columns of figures, there are electric lamps, which are lighted under control of the amount differentials and also under control of the bank of keys representing the number of dependents that the employee has.

Also on this chart of figures there are five extra columns in the upper right-hand corner of the chart, which figures relate to federal income taxes when the amounts of gross pay under \$60.00 end in an odd number of dollars, and these five columns take into consideration amounts from no dependents to four dependents.

There is also a control of a lamp in this machine, which is lighted whenever there is to be no tax chargeable against the man's gross pay. In other words, if a man makes only, say, under \$60.00 and has five or more dependents, of course, he will have no tax to pay on this amount, and therefore all of the lamps which relate to federal income taxes will be controlled so that they will not light, but a special lamp will be lighted to show green to indicate that there is no tax to be deducted.

There is also another lamp in connection with this automatic tax indicator, which is lighted whenever the employee's gross pay has reached \$3,600.00 or more, because

it is at this figure that there is no further social security to be taken from his pay. Therefore, when this figure of \$3,600.00 is entered into the machine from the original pickup of the man's prior earnings, or if the amount should reach \$3,600.00 during the addition of the current week's pay, which is being entered into the machine, this control will take place electrically and cause a lamp to be lighted, which will show red to indicate that the employee has had a gross pay so far during the year of \$3,600.00 and, therefore, that there shall be no more F. O. A. B. or social security tax deducted from his pay. During this operation, the F. O. A. B. lamps are all controlled so that none of them will be lighted, and therefore the operator will not see any amount in the columns which relate to the F. O. A. B. taxes.

For the purpose of illustrating one form of the present invention, the machine shown herein is constructed to perform the functions above stated in connection with the making up of the payroll for employees, and when used in connection with a machine similar to that shown in the above mentioned Spurlino et al. Patent No. 2,467,704, which machine is constructed primarily for the purpose of payroll work.

This present invention greatly enhances and speeds up the writing of payroll checks due to the fact that automatically, under the control of the amount of money which an employee earned and under control of the number of dependents which the employee has, the operator can instantly read off the amount of taxes which are to be deducted from such employee's gross pay, these amounts being indicated through a lighted area on the backs of certain columns of figures which are preselected according to the employee's gross pay which has been entered into the machine, along with the combined control, depending upon how many dependents the employee has.

Therefore, it is not necessary for the operator to stop and figure the amount of federal income tax, the amount of city income tax, or the amount of F. O. A. B. which is to be deducted from the employee's pay.

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

It is a further object of the present invention to provide means for indicating to the operator the amount of F. O. A. B. contribution, the amount of city income taxes, and the amount of federal income taxes which are to be deducted from the employee's gross pay, depending upon the number of dependents which the employee has.

A further object of the present invention is to provide means for automatically indicating to the operator or automatically signaling the operator that there is to be no tax deducted from the employees' payroll check.

A still further object of this invention is to provide automatically an indicating mechanism for an indicator, to tell the operator when the employee's gross pay has reached \$3,600.00, so that there should be no more F. O. A. B. deductions from this particular employee's pay.

A further object of the present invention is to provide electrically-controlled means under control of the amount differentials and under control of a bank of keys which record the number of dependents an employee has, to automatically indicate to the operator the amount of taxes which are to be deducted from the employee's gross pay.

Another object is to control relays to in turn control the lighting of lamps during another operation of a multiple operation than the one in which said relays are originally pulled up or engaged.

A still further object of the present invention is to provide a rotating drum mechanism upon which there is secured a chart of figures representing various gross pays, various F. O. A. B deductions, various city income tax deductions, and various federal income tax deductions, depending upon the number of dependents an employee has, which drum mechanism is located on top of the machine, so that the operator can readily read off the amount of various taxes to be deducted, depending upon the number of dependents the employee has.

Another object of the present invention is to provide a tax chart to be used in connection with a machine for making up payrolls, on which chart there are provided a plurality of columns of figures and behind each column there is a lamp which is adapted to be lighted under control of the amount differentials and under control of the number of dependents keys which are operated.

Another object is to control the lighting of the lamps under control of the gross pay set up on differentials in a sub-total operation.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, 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 diagrammatic view of a keyboard of the machine used in connection with the present invention, which keyboard is to control a machine of the type illustrated and described in the abovementioned Spurlino et al. Patent No. 2,467,704.

Fig. 2 is a detail sectional view through one of the amount banks of keys and shows a differential mechanism operated under control of these keys to control the printing of amounts, selector switches associated with certain differentials, and also with the bank of keys which will be hereinafter known as the bank of dependents keys are controlled by such differentials.

Fig. 3 is a detail of one of the selector switches used in connection with the amount differentials, the total control bank differential, and also the number of dependents bank of keys. These switches are also shown in diagrammatic form in the electrical wiring diagrams.

Fig. 4 is a detail of a portion of the transfer total drive mechanism from the machine.

Fig. 5 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. 6 is a detail of the totalizer-engaging control for the transfer of totals.

Fig. 7 is a detail view of the totalizer-engaging control for add, read, and reset operations.

Fig. 8 shows the printer drive control and the positive stop for the printer cam line under control of the row 3 printer selection.

Fig. 9 shows the total control plate which is differentially set under control of the keys in row 1. This also shows the connection to one of the selector switches which, as above mentioned, is under control of the keys in row 1.

Fig. 10 is a front elevation of the automatic tax indicator drum, which is shown partly in section, and associated mechanism.

Fig. 11 is a view in reduced scale, showing a part of a payroll machine, with the automatic tax indicator mounted on the upper left top part thereof.

Fig. 12 is a right-hand elevation view of the tax indicator and shows particularly the brushes associated with the \$10.00 differential which selects the \$10.00 group of lines on the chart.

Fig. 13 is a view taken approximately on line 13-13 of Fig. 10 and shows the individual line selection brushes and also shows a part of the lamp devices which are ar-

ranged behind the reading opening for the lines of figures on the chart.

Fig. 14 is a detail view, showing the contacts used in connection with the selections of the lines to be set in a readable position after the group of lines has been selected by the \$10.00 differential. These contacts are controlled by the brushes shown in Fig. 13 under control of the dollar differential.

Fig. 15 is a view taken approximately on line 15-15 of Fig. 10 and shows the contact rings which are used in connection with the brushes of Fig. 12 to control the group of lines to be selected.

Fig. 16 is a view approximately on line 16-16 of Fig. 10, looking in the direction of the arrows, and shows particularly the left end of the tax chart drum.

Fig. 17 is a facsimile of a payroll check which is printed by the machine, showing the gross pay, the various deductions, and the various balances which the employee has earned or has had deducted from his pay so far during the year.

Fig. 18 is a detail view of the mounting for the automatic tax indicator.

Fig. 19 is a detail view of a portion of the tax chart showing the various columns of figures relating to the Old Age Benefit deductions, the city income tax deductions, and the federal income tax deductions.

Figs. 20-A to 20-D, taken together, constitute a wiring diagram showing the lighting system or, in other words, the lamps which are used in connection with the tax chart so as to light up the proper column after the line has been selected under control of the amount differentials set according to the gross pay plus the number of dependents the employee has.

#### GENERAL DESCRIPTION

Described in general terms, the machine embodying the present invention is of the general type disclosed in the above-mentioned Shipley and Goldberg patents, and particularly the patent to Spurlino et al. No. 2,467,704. These patents all disclose a plurality of totalizers into which may be distributed various amounts, according to the business system for which the machine is being built. The Spurlino et al. patent last mentioned is used particularly for payroll work, and 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.

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

To control the printing of the various printing media, the machine has four rows of control keys and fifteen banks of amount keys, as shown diagrammatically in Fig. 1. The amount keyboard is what is known in the art as a split keyboard. The split in the keyboard is indicated by a dot-and-dash line and is marked "Split," so that the amounts under control of the keys on the left-hand side of the split go into one side of a split totalizer and the amounts under control of the banks of keys to the right of the split go into the other side of the split totalizer. The first bank of keys on the left is called the Number of Dependents bank and is what is known in the art as a combination bank. It controls printing in adding operations, and the differential may be controlled by a totalizer wheel in total and sub-total operations. Therefore, there is a split-and-normal condition from the rest of the banks to the immediate right thereof. The next two banks of keys are accumulator banks, and the fourth, fifth, sixth, and seventh banks of keys are to record the number of hours which the employee works. The eight banks of keys to the right of the split are all amount banks. The four right-hand banks are used for deductions, the five right-hand banks are usually used for earnings, and

the six right-hand banks are used to pick up prior earnings and prior amounts of various kinds necessary with the writing of the payroll checks.

The machine shown in the last-mentioned Spurlino et al. patent is adapted to print on an earnings record card to the right of the machine, on a check near the center of the machine, and on a payroll summary which is adapted to be fed and printed on the left side of the machine.

The four rows of control keys on the right side of the keyboard control the selection of the columns and the selection of the various line spaces in the columns to receive the printed data, according to the several operations of the machine necessary to complete a payroll check writing and issuing transaction.

The number of operations, of course, 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. As has been previously stated, the time clock card box is located on the top of the machine near the right side, and the automatic tax indicator is located on top of the machine to the left.

Generally, an operation of the writing of a payroll check, such as that shown in Fig. 17, comprises the following operations: first, pick up the employee's earnings to date from a summary payroll, and set this amount up on the amount keys and depress the earnings-to-date key in row 2. Then pick up the amount of federal income tax which has been previously deducted, then pick up the amount of city income tax previously deducted, and finally pick up the amount of federal O. A. B. or social security which has been previously deducted. This involves four operations of the machine, each of which is set into motion by the operation of the various keys in row 2. In other words, when picking up the federal income tax, the Withholding Tax key in row 2 is depressed; for the operation of picking up the city income tax, the City Tax key is operated; and when picking up the social security, the F. O. A. B. key is operated to release the machine and cause such amount to be added into the proper totalizers.

In the next operation, the operator sets up the number of dependents in the left-hand row of keys shown in Fig. 1 and also sets up, for example, the amount \$116.00 and depresses the Gross Earnings key, which is the top key in row 4.

The tax chart which is placed on the automatic tax indicator drum is preferably photographed on a film so that the numbers are white, and, when lamps are lighted behind these numbers, the operator can very readily read the number which has been selected.

Therefore, in conjunction with the present invention, there are provided on the inside of the drum 17 electric lamps which are adapted to be controlled as to their lighting under control of the amount of the gross pay and the number of dependents which are registered into the machine. The lamps are shown diagrammatically in Fig. 20-A of the wiring diagram.

There are a number of relays used in connection with this invention, and these are all numbered in the wiring diagram, the complete diagram consisting of Figs. 20-A to 20-D inclusive.

In order to simplify the schematic wiring diagram to limit the number of lines as much as possible, the 6-volt and 48-volt taps from the A. C. transformer and the 115-volt power input sources are shown as battery and ground.

To continue on with the operation in the General Description wherein the \$116.00 gross pay has been entered into the machine, as above mentioned, the Gross Earning key in the No. 9 position in row 4 is depressed for this operation.

In the wiring diagram, there are also shown the selector switches in a diagrammatical form. There is one selector switch associated with the Number of Dependents keys

differential, one selector switch associated with the thousand-dollar bank differential, two switches associated with the hundred-dollar bank differential, three switches associated with the ten-dollar bank differential, two switches associated with the dollar bank differential, one associated with the dimes bank differential, one associated with the units bank differential, and one selector switch associated with the differential in row 1. These are all diagrammatically shown in the wiring diagram in Figs. 20-C and 20-D.

All relays R1 to R15, R17, and R23, when once operated, are held operated under control of relay R16, which is operated during Net Pay operations to cause release of said relays, the Net Pay operation being the final check writing operation. Thus all relays are in normal positions ready to control the writing of the next check.

The selector switch associated with the row of Dependents keys differential controls the operation of relays Nos. R4 to R13 inclusive. These relays have been so numbered on the wiring diagram in Figs. 20-A to 20-D. To the left side of these relays, there is a series of numbers 0 to 9, which correspond to the zero position of the Dependents bank up to the 9 position of the Dependents key bank.

Relays R1, R2, and R3 are associated with and assist in the controlling of the lighting of the lamps associated with the social security columns of figures, the city income tax figures, and, under certain conditions, the federal income tax figures.

The depression of key 9 in row 4—namely, the Gross Earnings key—causes the closing of switch labeled key 9 row 4 to provide current to the selector switch associated with the number of Dependents keys differential. Therefore, the selector switch associated with said differential pulls up relay R4 when there are no dependents. In other words, when the differential of this bank stops at zero, the relay R4 will be energized or pulled up.

During this operation, when the number of dependents varies from zero to 9, the relays R4 to R13, respectively, are operated, depending upon whether or not no keys 1 to 9 are depressed. When there is no key depressed, the relay R4 is pulled up; when No. 1 key is depressed, relay R5 is pulled up, etc., down to the No. 9 key, which pulls up relay R13.

During this operation, circuits will be set up to later control the lighting of the desired lamps. When the amount is under \$60.00, the relay R14 operates, and, if it is an even number of dollars, one of the lamps zero to 4 for the number of dependents will be lighted, and, when it is an odd number of dollars, one of the lamps 5 to 9 will be lighted. If the amount is over \$60.00 and there are no dependents, the zero lamp will be lighted, and proportionately down the line, if there are nine dependents and the amount is over \$60.00, the No. 9 lamp will be lighted. If the amount is under \$60.00 and there are five or more dependents, then there is no tax, and there will be a No. Tax green light which is lighted.

The next operation is to depress the Gross key in row 1 or the total row. This is a sub-total operation; i. e., the machine takes a sub-total of the crossfooter and therefore sets the amount differentials under control of the gross pay in the crossfooter, which, we will assume, is \$116.00. The depression of this key initiates the machine operation and at the proper time causes cam switch D to again close. This switch is normally closed at the beginning of the operation of the machine but is open during the movement of the selector switches. While the switch is open, the differential is set under control of this Gross key; then switch D closes at the proper time. This supplies the current to the three selecting switches associated with the \$10.00 bank differential and the two selecting switches associated with the hundred-dollar bank differential to position the tax indicator drum, to select the group of lines under control of the \$10.00 bank differential. In other words, there are five groups of lines

associated with each \$10.00 jump in gross amounts. In addition, power is supplied to the dollar selector to determine even or odd dollars. Then switch C closes to supply power to the dime bank selector switch, and it supplies power to the penny bank selector when needed, based on 66-cent pay steps.

Therefore, first it is necessary to select a group of lines, and then, under control of the amount in the dollars bank differential, the particular line of the group is selected. The supplying of the current to the \$10.00 and \$100.00 switches and to the even dollar bank, by the depression of the Gross key in row 1, also energizes relays R1 and R3 to partially control the four F. O. A. B. lamps and to fully control the two city income tax lamps. One of the \$10.00 switches energizes relay R14 when the amount is below \$60.00 to partially control the federal income tax lamps. Now, of course, if the amount is below \$60.00, relay R14 controls the federal income tax lamps when there are no dependents to four dependents on the even or the odd dollar amounts. If there are more than four dependents, then a No Income Tax lamp is lighted when relay R14 operates.

The operation in which the Gross key in the total row or row 1 is depressed controls the lighting of the lamps in the city income tax columns and the social security columns as follows. When the dollars are even and the cents are from nothing to 33 cents, the relays R1, R3, and R2 are operated, and lamp No. 1 under the city income tax column and lamp No. 1 on social security column are lighted. When the amounts are in even dollars and the cents are from 34 cents to 99 cents, relays R1 and R3 are operated to cause the lighting of lamp No. 1 in the city income tax column and lamp No. 2 in the social security column. When the amount of dollars is odd and the amount of cents runs from nothing to 66 cents, relay R2 is operated, which causes lamp No. 2 in the city income tax column to be lighted and lamp No. 3 in the social security column to be lighted. When the amount of dollars is odd and the cents run from 67 cents to 99 cents, the city income tax lamp No. 2 is lighted and the social security tax lamp No. 4 is lighted.

During this operation the drum is positioned and relay R18 is pulled up (if even tens of dollars), R19 (if \$100.00) R20 and R21 (reversing relays) R22 (delayed action relay) and R23 (a two-speed relay) are pulled up during this operation.

The next operation is the extension of the earnings to date, which is controlled by the depression of "Extension" key in row 1 and "Earnings to Date" key in row 2. If the amount is over \$3,600.00, the relay R15 is pulled up, the red light is operated, and any F. O. A. B. lamp is disabled. During this operation, relay R17 supplies power to the lamps.

The final operation, of course, is the Net Pay. To get the Net Pay of the employee, the operator depresses the Net Pay key in row 1, and this pulls up relay R16 and releases all of the circuits.

It might be well to say here in connection with the general description that there are three basic circuits in connection with this invention. One circuit controls the position of the drum, one circuit controls the income tax lamps, and another circuit controls the city income tax and the F. O. A. B. social security lamps.

## DETAILED DESCRIPTION

### Keyboard

The keyboard of the machine is shown in diagrammatic form in Fig. 1.

The left-hand bank of keys 59 are used for the purpose of registering the number of dependents in connection with the deduction of the federal income taxes. The next six banks of keys 60 are used to register the number of hours and may be used in connection with the W-2 form for setting up the total amount of wages earned. Between key banks 7 and 8 there is a permanent split.

To the right of this split, the eight banks of keys 61 are used for setting up deductions and for setting up amounts of earnings to date and prior earnings, and also, in connection with the W-2 forms, are used to set up the total amount of taxes which have been deducted for various purposes.

To the right of the amount keys 60 and 61 are four rows of control keys designated "Row 1," "Row 2," "Row 3," and "Row 4." Keys 62 of row 1 are operating or motorized keys; that is, they release the machine for actuation when depressed. The "Gross" key 62 causes a sub-total of the crossfooter to set up the employee's gross pay in the amount differentials. The "Net Pay" key 62 causes a clearing of the crossfooter, which at this time contains the employee's net pay. Key 63 is a non-motorized key and is used in conjunction with the "X Earnings to Date" key of row 2. The top keys 64 of row 1 are non-motorized keys and are used to select the totalizers corresponding to the keys of rows 2, 3, and 4 during clearing operations.

The keys of row 2 are designated 65. The keys of row 3 are designated 66, and the keys of row 4 are designated 67.

The keys "X," "Y," "Z," and "W" 65 of row 2 are used to pick up the totals of Earnings to Date, Withholding Tax, City Tax, and F. O. A. B. Social Security, respectively, prior to the writing of an individual payroll check. The "W-2" key is used to release the machine when the W-2 forms are being set up and printed by the machine for use to be sent to federal income tax offices. The "Over \$3,600.00" key is used to release the machine when an employee's pay has reached \$3,600.00 and, therefore, there should be no further deductions for social security taken from this particular individual.

The "K Net Pay" key 66 of row 3 is used for printing special checks when there are to be no deductions, as in the case of a vacation pay check. The remaining keys "J" to "T" in this row 3 are used to set up the various deductions which may be applicable to any employee.

The keys 67 of row 4, marked "B" to "H" and "P" and "L" are used in connection with the writing of the payroll according to the designations on the keys opposite the letters.

The keys of rows 2, 3, and 4 select various totalizers in the machine in the manner which has been fully illustrated and explained in the previously-mentioned Spurlino et al. Patent No. 2,467,704.

### 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 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, keys 62 of row 1, keys 65 of row 2, keys 66 of row 3, and keys 67 of row 4, as shown in Fig. 1. These keys will be explained more in detail later in the specification.

Depression of any one of the operating or motorized keys releases a key lock shaft 69 (Figs. 2 and 9) 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 cam shaft 70, journaled in the machine side frames 74. The movement of this key lock shaft 69 simultaneously operates the switch mechanism which closes the circuit to the motor, thus causing the motor to operate and drive the main drive shaft 70.

The machine disclosed 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 70 is considered "one cycle" of operation.

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

To obtain the employee's gross pay, the operator adds together the several different types of pay, such as regular pay, overtime pay, and possibly a bonus, which the employee may have coming, and then makes a sub-total operation by depressing the "Gross" key 62 in row 1, or the total row.

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 operations of the total-taking and sub-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 69 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 home position.

The tripping or release of the shaft 69 is one of the first things that happen during the operation, and this takes place before the cam shaft 70 operates. Near the end of the cycle, the shaft 69 is moved to its normal position.

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.

#### *Amount differential mechanism*

The differential mechanism for each of the banks of keys 59, 60, and 61 is identical, and in Fig. 2 there is shown a cross section of the machine alongside of one of the banks of keys 61. Therefore, it is thought that a description of this one differential mechanism will suffice for all banks of amount keys 60 and 61 and also for the bank of keys 59, which relate to the number of dependents.

Moreover, the key bank frames for the keys 59, 60, and 61 are identical, as is the zero stop mechanism for these banks of keys, and, therefore, the description of the bank of keys 61 and its supporting framework, shown in Fig. 2, will suffice for all.

The keys 61, which are used in this case to record the amounts of moneys, are mounted in the usual key frame 71, supported by rods 72 and 73, which, in turn, are supported by machine side frames 74 (Figs. 2 and 8). The keys all cooperate with a detent 75, having a flattened pin 76, which retains the key in its depressed position, as fully illustrated and described in the above-mentioned Shipley patents.

This detent 75 is pivoted to an arm 77, which, through a pin 78, on an arm 79, and a shaft 80, rocks a zero stop pawl 81 for this particular denomination counterclockwise out of the path of a reset spider 82, free on the hub of an amount differential actuator 83, rotatably supported by a hub 84, extending between two similar amount differential support plates 85 (only one of which is shown), in turn supported by rods 86, extending between and supported by the machine side frames 74. There is a pair of support plates 85 for each amount differential, and a tie rod 87 extends through the holes

in the centers of the hubs 84 to secure all of the amount differentials in a compact unit. The reset spider 82 has, in its forward end, a slot which engages a stud 91 in a bell crank 92 pivoted on an extension of a differential actuator 83. This bell crank 92 is connected by a link 93 to a latch arm 94, which is pivoted on the differential actuator 83. The upper end of the arm 94 has a foot 95, which cooperates with a shoulder 96 on a driver 97, which receives a regular excursion clockwise and then counter-clockwise to its normal position each operation of the machine. A spring 98 holds the foot 95 of the latch arm 94 in engagement with the driver 97. The driver 97 is pivoted on the hub 84 of the differential actuator 83 and is connected by a link 99 to a lever 100, pivoted on a stud 101 supported by the plate 85. The lever 100 carries rollers 102 and 103, which cooperate, respectively, with the peripheries of companion plate cams 104 and 105 secured to the main drive shaft 70. This main drive shaft 70 receives its motion by the usual mechanism, which is fully illustrated and described in the above-mentioned Shipley patents but which is not shown herein.

Depression of any one of the keys 61 moves its lower end into the path of a forward extension 111 of the bell crank 92, and operation of the machine causes the cams 104 and 105, as previously described, to make one complete revolution in adding and/or subtracting operations to rock the lever 100 and the driver 97 clockwise, whereupon the latch foot 95 carries the differential actuator 83 and the spider 82 clockwise in unison therewith until the extension 111 of the bell crank 92 engages the end of the depressed keys 61. When this occurs, the bell crank 92 is rocked counter-clockwise, whereupon the link 93 rocks the latch arm 94 counter-clockwise, disengages the foot 95 from the shoulder 96 of the driver 97, and causes a nose 112 on an extension of the link 93 to engage the proper one of a series of alining notches 113. These notches 113 correspond to the differential positions of the differential actuator 83 and are cut in a plate 114, supported by extensions of the plate 85 and the rod 86. This positions the actuator 83 according to the value of the key 61 which has been depressed, without interfering with the oscillating movement of the driver 97 and the connected parts. After the latch arm 94 is disengaged from the shoulder 96 of the driver 97, an arcuate surface 115 on the periphery of the driver 97, in cooperation with the sole of the foot 95, locks the latch in the corresponding notch 113 to retain the differential mechanism in said position.

When the lever 100 reaches or nears the terminus of its initial clockwise movement, a roller 120, carried thereby, engages the under surface 121 of a beam 122 pivotally mounted on the differential actuator 83 and forces an arcuate upper surface of the beam to contact an undercut portion of the hub 84 to position said beam 122 in proportion to the value of the key 61 which has been depressed. The rear end of the beam 122 embraces a stud 123 of a link 124 pivotally connected at its upper end to an alining segment 125 secured to one of the nested sleeves 126 mounted on a shaft 127 supported by the side frames 74. This aliner 125 has alining notches 128 to cooperate with aliner 129, mounted on a shaft 130. This aliner alines all amount differential actuators 83 in a manner described in the Shipley Patent No. 1,619,796.

The lower end of the link 124 is pivotally connected to a segment 141 freely mounted on a shaft 142 journaled in the side frames 74. The segment 141 carries a stud 143, which engages a cam slot in a zero elimination cam plate 144 pivotally mounted on a stud 145 in a segmental gear 146 free on a shaft 147 also journaled in the side frames 74. The teeth of the segment gear 146 mesh with the external teeth of an external-internal ring gear 148, the internal teeth of which mesh with a pinion 149, which drives a square shaft 150. The square shaft, in turn, drives similar pinions meshing with the internal

teeth of the gears similar to the gear 148, the external teeth of which gears are adapted to mesh with and drive corresponding denominational type wheels 151 in each row of the column printing mechanism, as fully illustrated and described in the above-mentioned Spurlino et al. Patent No. 2,467,704.

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

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 144, 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.

The mechanism described above transmits the positioning of the beam 122 to the segments 125, so that at each operation of the machine the segment 125 is set and left set in the position according to the key 61 which has been depressed.

Therefore, due to the aliner 129, the differential mechanism and the link 124 are positively alined in the differential position into which they have been set.

The positioning of the beam 122 through the link 124 also controls the positioning of selector switches, which will be described hereinafter and which are connected to certain of the amount banks, as will be hereinafter set forth.

The machine is provided with the usual cabinet or casing 152, a portion of which is shown in Figs. 2 and 5. This casing is provided with the usual openings closed by hinged covers and provided with locks to prevent any unauthorized persons from tampering with any of the machine mechanisms.

#### *Selector switches*

In connection with the present invention, there are twelve selector switches, one of which is shown in detail in Fig. 3 and all of which are shown diagrammatically in Figs. 20-C and 20-D of the wiring diagram. These selector switches are substantially all alike, with the exception of the constant contact, which is separated in one of the \$100.00 bank switches and in the total row 1 switch, as shown in the wiring diagram.

There is one of the selector switches associated with the differential for the bank of dependents keys 59; there is one selector switch associated with the \$1,000.00 bank differential; there are two selector switches associated with the \$100.00 bank differential; there are three selector switches associated with the \$10.00 bank differential and two selector switches associated with the dollar bank differential; there is one selector switch associated with the dimes bank differential; there is one selector switch associated with the penny bank differential; and there is one selector switch associated with the mechanism of row 1, which is the total control row.

The selector switch will now be described in detail with particular reference to Fig. 3. These switches are all mounted in front of the machine tie bar 153, which connects the machine side frames 74. Each selector switch includes a stationary segment 160, upon which are mounted ten individual contact or terminal members 161, which are numbered 0 to 9. These members 161 are all electrically insulated from the segmental member 160. Also carried by the segmental member 160 is an arcuate contact member 162, which also is electrically insulated from the segmental member 160.

Contacting the zero terminal 161 and the arcuate contact plate 162 is a wipe switch 163, carried by and

electrically insulated from a differentially adjustable arm 164, which is secured to an internal-external gear 165, the internal teeth of which drive a pinion 166 on a square shaft 167. Also mounted on this shaft 167 is another pinion (not shown but identical with the pinion 166), which meshes with internal teeth on an internal-external gear 168, which meshes with an internal-external gear 169. The internal teeth on the gear 169 mesh with a pinion 170 on the previously-described shaft 150, which, it will be remembered, is set differentially under the control of the differential mechanism in Fig. 2 as determined by the key 61 which has been depressed; or, if no key has been depressed, it is determined by the zero stop 81.

From the above description it can be clearly seen that the differential movement imparted to the gear 169 by the differential mechanism, under control of the keys 61, will, through the gears 169, 168, and 165, the square shaft 167, and the pinions 166, be imparted to the wipe switch carrying arm 164.

Therefore, the wipe switch arm 164 will move the wipe switch 163 clockwise, so that the switch will contact the arcuate contact 162 and one of the contact terminals 161, depending upon the positioning of the differential mechanism, which at this time is under control of one of the depressed keys 60. However, no electrical circuits are completed at this time.

The making and completion of circuits through the switches 163 and the terminals 161 under control of the differentials occur during a sub-total operation, when the Gross key 162 is depressed, to cause the differentials to be set under control of the amount of an employee's gross pay, which now determines the position of the wipe switches 163. The electrical circuits, to be described later, determine which lamps are to be lighted in connection with the tax chart and also, depending upon the movements of the differentials associated with the \$10.00 and \$100.00 banks, as controlled by the gross pay totalizer wheels, will determine the distance that the tax drum is to be rotated to move the chart to select the group of lines and, after the group of lines are selected, to move the chart under control of the dollar bank differential to select the particular line of the group which has been previously selected. After the selection of this particular line, then, under the control of the differential for the Number of Dependents keys 59, the lamp associated with the proper column of figures in connection with the federal income tax is lighted, so that the operator will make the proper deduction from the employee's pay check, according to the number of dependents and according to the gross amount of pay, as shown in the left-hand column.

#### *Differential mechanism for the control bank*

The differential mechanism for the control banks shown in row 2, row 3, and row 4 of Fig. 1 are not shown in this particular application, but the differential mechanism for the banks of control keys shown and described in the above-mentioned Spurlino et al. Patent No. 2,467,704 is the same type of mechanism which is used in connection with the control keys in the present application, and reference may be had to this patent for such mechanisms for illustration and description thereof.

As has been previously stated, there is one of the selector switches like that shown in Fig. 3 associated with the bank of control keys in row 1, and, of course, the differential mechanism under control of the keys in row 1 controls the selector switch for that bank under the control of the Gross key 62, which is depressed.

#### *Totalizers*

The machine shown in this application has the usual three lines of totalizers, numbered 1, 2, and 3 in Fig. 2. As before stated, the totalizers on each of these lines split between the keys 60 and 61 (Fig. 1); that is, there is no transfer mechanism between the totalizer wheels associated with the left-hand bank of keys 61 and the first

right-hand bank of keys 60 in connection with their respective differential mechanisms.

The No. 1 line (Fig. 2) 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 may have two adding totalizers on it, as described in the above-mentioned Spurlino et al. Patent No. 2,467,704.

The No. 3 or front totalizer line, which is controlled by the keys 66 of row 3, has totalizers on each side of the split for each of the keys K to T and one in the zero position, herein called the GT3 totalizer.

The rear of No. 2 totalizer line has nine adding totalizers on each side of the split, one for each of the keys B to L, and also one in the zero position, called the GT4 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 United States patent issued to Pascal Spurlino, William M. Carroll, Arthur R. Colley, and Alfred G. Kibler, 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 (Fig. 2), which is the crossfooter at the right of the split, is indicated by the reference number 175. The totalizers on the No. 2 or back line are numbered 176. This number applies to the totalizers on both sides of the split. The totalizers on the front or No. 3 line are numbered 177, 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. They are fully illustrated and described in the previously-mentioned Shipley patent, and, therefore, no further description of the construction of these totalizers is felt necessary herein.

As usual in machines of this type, the actuators 83 are divided into three tooth sections, 178, 179, and 180. The section 178 actuates the crossfooter and also the regular totalizers on the No. 1 or upper totalizer line, the section 179 actuates the totalizers 176 on the No. 2 or rear line, and the tooth section 180 actuates the totalizers 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 178, 179, and 180 of the actuators 83 after the actuators have completed their setting movements in a clockwise direction under the control of the keys 60 and 61.

In subtract operations, the corresponding subtract wheels of the crossfooter 175 are engaged with the tooth section 178 of actuator 83 exactly the same as in adding operations, and the return movement of the actuator reversely rotates the adding wheels 175 of the crossfooter through the reverse gearing which is well known in the art and shown in several of the above-mentioned Shipley patents and also in the Spurlino, Carroll, Colley, and Kibler Patent No. 2,375,594.

Counter-clockwise return movement of the actuators 83, as explained above, rotates the corresponding wheels of the selected and engaged totalizer or totalizers in proportion to the value of the keys 60 and 61 which have been depressed, to enter into the totalizers the amounts according to the keys which have been so depressed.

If no amount key 61 is depressed, the zero stop pawl 81 remains in the path of the spider 82 on the initial movement of the actuator 83 and engages said spider and disengages the latch 95 from the driver 97 to arrest the actuator 83 in the zero position. After the actuator 83 is positioned at zero, the roller 120 positions the beam 122, the link 124, and the segment 125 in proportion thereto, as is well known in the art. At the same time, this link 124 also positions the segment 141 and the seg-

ment 146 to differentially position the internal gear drive mechanism, in the manner which has been previously described, to differentially set the proper printing wheels.

At the end of every type of operation, the actuator 83 is always returned to home position, as shown in Fig. 5. However, the links and the printing mechanism controlled thereby and also the segments 125 and the segments 141 and 146 and the internal-external gear mechanisms remain in set positions at the end of the machine operations and are moved directly from those 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 mechanism for engaging the totalizers with the actuators and disengaging them from the actuators during adding, subtracting, reading, totalizing, or transfer total operations in this application is substantially like such mechanism shown in the above-mentioned Spurlino et al. Patent No. 2,467,704, in that the totalizers in the present application are adapted to perform all of the functions necessary with the accumulation and recording of all types of additions, subtractions, reading, totalizing, and transfer total operations that are necessary in connection with the production of a payroll and the issuing of the employee's pay roll checks and the keeping of other records in connection with this type of work.

#### *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, the totalizers are moved into engagement with and out of engagement from their actuators during adding time, during totaling time, and during total transfer time, as 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 60 and 61 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 clockwise, and the amount on the totalizers is taken therefrom, 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 with them, 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 on the actuators, after which the selected totalizer on the rear or No. 2 totalizer line is engaged with the 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 to the selected totalizer on line No. 2.

The mechanism for accomplishing the engagement and disengagement of the totalizers, under the conditions just above mentioned, will now be described.

The crossfooter on the top totalizer line and the other totalizer on this line, and all the totalizers on the rear line and all totalizers on the front line, are each sup-

ported in a shiftable framework 240 (Fig. 2), which frameworks in turn are supported between the main frames 74 of the machine.

The shiftable framework 240 for the upper totalizer line, which carries the crossfooter, includes a shaft 241 (Figs. 2 and 5) having mounted on opposite ends thereof rollers 242, which engage similar slots 243 in cam plates 244 secured to the machine side frames 74. These slots 243 are radial with the center of the tie rod 87 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 right-hand crank 245, as shown in Fig. 5, 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, in a forward extension thereof, a slot 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 and a substantially vertical slot 259 to 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 74. Another arm of the yoke 260 carries a stud 264, which engages a camming slot in the total control plate 266 (Fig. 9), which is differentially positioned under control of the keys 62 and 63 of row 1 (Fig. 1) 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 engagement 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. 5. This lever 270 is operated by a box cam 271, secured to the main drive shaft 70. The cam race for this box cam 271 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. 5), in the direction of its length, and restored back to the position shown in Fig. 5 during each rotation of the shaft 70.

The shifting of the link 248, to control the engagement 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 in turn are controlled by the keys of rows 2, 3, and 4 (Fig. 1), and the engaging movement of said link is controlled in said sub-total and total-taking operations by a slot in the total control plate 266 (Fig. 9) 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 the stud 273 in the spider 251, as shown in Fig. 5, and, when the stud 249 is engaged with the hook 250 of the spider 251, the lever 270, under the influence of the cam race in the cam 270, shifts the slide 253 rearwardly or to the right, as viewed in Fig. 5, 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, thus causing the rollers 246, in cooperation with the cam slot 247, to shift the shaft 241 and the totalizer framework 240 (Fig. 2) to engage the selected set of wheels on the crossfooter, or to engage the other totalizer on this upper line with the actuators 178.

As previously explained, in adding and subtracting operations, the engagement of the selected set of wheels for the actuators occurs after the actuators have been positioned under the control of the depressed amount keys 60 or 61, and counter-clockwise return movement of said actuators 83 rotates the selected wheels in proportion to the value of the keys depressed to enter therein the amount set up on the keyboard. After the actuators 83 have completed their counter-clockwise return movement, the cam 271 returns the slide 252 forwardly to return the spider 251 counter-clockwise to disengage the wheels of the engaged totalizer from the amount actuators 83.

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 62 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 the shaft 263 later in the sub-total-taking operation. Clockwise initial movement 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 70 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 totalizers with the actuators 83 prior to their clockwise initial movement, 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 re-setting, as the case may be. During the second cycle of a sub-total or total-taking operation, the actuators 83, in their clockwise initial movement, 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 83 in proportion to the amounts on said totalizer wheels.

After the amount actuators 83 are thus positioned in proportion to the amount standing on the wheels of the selected totalizer, the roller 103 (Fig. 2) engages the beam 122 to position the segment, the printing mechanism, and the wipe switch 163 of the selector switches 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 rearward initial movement 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 83. 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 70, and consequently the selected totalizer wheels remain in engagement with the actuators 83 during their counterclockwise return movement. 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 forward return movement of the slide 253 near the end of the second cycle of operation will impart counter-clockwise return movement to the engaging spider 251 to disengage

the wheels of the selected totalizer from the amount actuators 83.

In total-taking or clearing operations, the movement of the total control plate 266 from adding position, shown in Fig. 9, to total or clearing position imparts clockwise initial movement 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 the 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 83 at the end of the first cycle of movement of the shaft 70. In the second cycle, the amount actuators 83 turn the 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 counter-clockwise return movement of the amount actuators 83 (Fig. 2), initial movement of the cam 271 in the second cycle of operation of the shaft 70 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 83, thus leaving said wheels in a zeroed condition. After the spider 251 has thus been returned counter-clockwise to normal position, and prior to forward return movement 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 the slide forwardly to normal position, after which counter-clockwise return movement of the yoke 260 and the plate 255 engages the notch 272 with the stud 273, as shown in Fig. 5.

A pawl 276 (Fig. 5) is actuated by a cam slot 277 in the cam plate 255 and 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 aliners 280 and 281, connected by a pin-and-slot connection 282. A link 283, pivoted to the aliner 280, is operated by a cam (not shown) secured to the main drive shaft 70 to cause the aliner 280 to cooperate with the stud 273 on the spider 251, and also to cause the aliner 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.

When the Net Pay key 62 is operated, the crossfooter in the No. 1 or top totalizer line is cleared, and the amount taken therefrom is automatically transferred to the "Net Pay" totalizer associated with the Net Pay key 66 in row 3.

#### *Transfer total mechanism*

Inasmuch as it is desirable to transfer amounts from the crossfooter or balance totalizer on the top line into the Net Pay 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.

The No. 2 or rear totalizer line is mounted in the shiftable frame 240 (Fig. 2), which is similar in every

respect to the frame 240 for the upper totalizer line. This particular framework for the back totalizer includes the shaft 300, having mounted on each end thereof rollers 301 (Fig. 6) (only one of which is shown here), which cooperate with guide slots 302 in the totalizer cam plates 303, mounted on the inside of the frames 74. On each end of the shaft 300, there are engaging cranks 304 carrying rollers 305, which cooperate with the cam slots 306 in the cam plates 303.

The crank arm 304 and the right-hand end of the shaft 303, as shown in Figs. 5 and 6, are 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 351. 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 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 conditions, the roller 313 remains in engagement with the notch 314 on the plate 315, thus connecting the plate to the arm 308, which in turn is connected to the crank 304 and the shaft 300, and under these conditions the No. 2 or rear totalizer line receives its engaging and disengaging movement 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 62 is depressed, into the 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 totalizer 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.

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. 5 and 6) secured to a shaft 321 supported by the right-hand machine frame 74 and an auxiliary machine frame 90 (Fig. 8). Secured to the shaft 321 is an arm 322, having pivoted thereto a link 323, which is also pivoted to a shaft 324 mounted on a rod 325 supported by the side frame 74 and the auxiliary frame 90. 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 frame 74 and the auxiliary frame 90. Also secured to the sleeve 330 is a segment 332 (Fig. 9), which meshes with a segment 334 pivoted on the shaft 142. 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 62 and 63 of row 1 (Fig. 1), 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. 5) according to the position of the key 62 or 63 which is depressed. As shown in Fig. 5, 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 position of the Net Pay key 62. Consequently, whenever the Net Pay key is depressed, the notch 337 is presented to the finger 326, thus allowing the crank 324 to be rocked counterclockwise, 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 clockwise 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. 4), 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 the stud 345 carried by the auxiliary frame 90. 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 70, and which shaft 350 is driven from the main shaft 70 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 total 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 counterclockwise 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 counterclockwise, and the crank 304 will be rocked likewise, whereupon the cam slot 306 (Fig. 6) will cause the totalizer line to be engaged with the actuators 83 to have the amount which was taken from the upper totalizer line No. 1 transferred to the selected totalizer on the back line No. 2.

In order to free the finger 326 from the periphery of the segmental arm 327 to permit the latter to move freely by the total control plate 266, a cam 351 is secured to a shaft 352, carried by the side frame 74, and the auxiliary frame 90 contacts the roller 353 on the arm 338, rocking the arm slightly counterclockwise 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 key 62 in row 1. This shaft 352 is driven each operation of the main cam shaft 70 by means of a gear 354 (Fig. 8), which is secured to the main cam shaft 70. This gear 354 meshes with a gear 355 secured to the shaft 352. Consequently, the shaft 352 is given two counterclockwise rotations, during each reading operation, totaling operation, and transfer-total operation, by the shaft 70. The cam 351 is so timed that during the first operation of the shaft 352 the arm 338 will be moved slightly counterclockwise 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 position 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 83 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-total operation.

The means for driving the shaft 350 (Figs. 5 and 8)

from the main cam shaft 70, 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 70, is a plate 360 (Fig. 8), 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 its right end in the auxiliary frame 90, and, since the shaft 350 is in axial alignment with the shaft 70, the other end of the shaft 70 extends about midway into the collar 361 through the plate 360.

The shaft 70 also extends about midway through 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. 8, the plate 360 is driven clockwise, 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 70. 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 90. The gear 367 drives the gear 369, which is secured to a drive shaft 370 for the printer. However, none of the printer mechanism is shown in connection with the present application, and reference may be had to the above-mentioned Spurlino et al. Patent No. 2,460,704 for a description of the printer mechanism in machines of this type.

From the above description, however, it will be clear that, when the shaft 70 of the machine is driven clockwise one rotation during adding operations, the auxiliary aligned shaft 350 will be given a movement likewise 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 70 receives two rotations in a well-known manner. In order to arrest the shaft 370 after such a 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 the finger 372 on the pawl 363 and causes the 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 total-transfer 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 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 one complete 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 70 are always stopped in their exact home positions. This mechanism is controlled by the previously-described key lock line 69, which, it will be recalled, when the machine is released, is given a clockwise movement and is

restored counterclockwise to normal near the end of each operation of the machine. This shaft 69 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. This arm 377 has an integral arm 378 cooperating with the stud 379 secured to the gear 369.

In Fig. 8, the parts are shown in their normal positions, with the arm 378 immediately underneath the stud 379 on the gear 369. When the machine is released, the shaft 69 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 clockwise. However, before this shaft 370 completes a cycle of movement, the key lock shaft 69 is restored counter-clockwise to normal position, thus reversing the direction of movement of the linkage just mentioned, whereupon the arm 378 will again be moved into the position shown in Fig. 8, 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 this 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 70.

#### Tax chart

In Fig. 19 there is shown a facsimile of a portion of a tax chart involving the Social Security Taxes, City Income Tax, and Federal Income Taxes based on gross pays which are shown in the left-hand column of figures.

In the present invention, the tax chart 190 used in the machine goes up to \$200.00 gross pay per week. However, in Fig. 19, \$116.00 is the highest gross pay which is shown. However, the rest of the figures on the chart actually used are in proportion.

The left-hand column of figures shows gross amounts of pay from \$4.00 up to \$116.00 by steps of \$2.00.

The next four columns are social security or F. O. A. B. deductions which are to be made based on the gross pay. The left-hand column of OAB figures is based on the amount of \$4.00 and no cents up to \$4.33. Assuming now that we are considering the \$4.00 gross pay, the next column of social security figures, which is \$.07, is based upon any gross pay of \$4.34 to \$4.99. The third column of social security figures, which reads \$.08, is based on gross pay of \$5.00 to \$5.66, and the fourth or right-hand column of social security figures of \$.09 is based on the gross pay of \$5.67 to \$5.99. This \$5.99, it will be noticed, is \$.09 social security deduction. Likewise, it is the same figure for the \$6.00 deduction.

The sixth and seventh columns of figures relate to city income tax deductions. This figure is based on one half of one percent of the gross pay.

The figure of two cents in the left-hand column of the two city income tax columns is based on \$4.00 gross pay, at the rate of one half of one percent, which is two cents for \$4.00. Should a man's pay be \$4.99 or \$5.00 up to \$5.99, the city income tax at the rate of one half of one percent would be three cents, for a gross pay of that figure.

The next ten columns of figures are taxable deductions for federal income taxes, based on the number of dependents. The left-hand column of federal income tax deductions shows the tax to be deducted when there are no dependents. The next column shows the deductions for one dependent, the next column deductions for two dependents, the fourth column deductions for three dependents, the fifth column deductions for four dependents, the next column deductions for five dependents, the next column deductions for six dependents, the next column deductions for seven dependents, the next column deductions for eight dependents, and the last or right-hand column deductions for nine dependents. All of these ten columns, however, are based on deductions

where the gross pay is in even dollars, beginning with \$4.00 and, according to the chart here, which is only partial, as previously stated, up to \$116.00.

Whenever the amount of the total pay is in odd dollars, beginning with \$5.00 and going to \$59.00 by two-dollar steps, there are five columns of figures in the upper right-hand part of the chart in Fig. 19. The left-hand column of these five columns is based on odd dollar totals for gross pays when the employee has no dependents. The second column is when the employee has one dependent, the third column two dependents, and the fourth column three dependents, and the last column when the employee has four dependents.

As stated earlier in the description, this tax chart is preferably made by photographing the figures on film from a prepared chart, so that the numbers as recorded here by facsimile in Fig. 19 will be white on the film and therefore will be translucent when a lamp is lighted behind the figures.

#### Tax chart drum

The tax chart is mounted on a rotatable drum composed of a cylinder 191 (Fig. 10), made of a transparent material such as Lucite. This cylinder 191 is mounted on rings 192 and 193, each of which has secured to its side a ring gear 195 and 196, respectively.

Rigidly secured to the ring 192 and the ring gear 195 is a disk 197 having a bearing sleeve 198. The disk 197 is made of an electrical insulating material for purposes to be described hereinafter.

#### Drum support

The drum, consisting of the cylinder 191, the rings 192 and 193, the ring gears 195 and 196, and the disk 197, is mounted to rotate in a framework, which will now be described.

Rising vertically from a base plate 200 are a left side plate 201 and a right side plate 202 (Fig. 10), which are connected by a front tie bar 203 (Figs. 12, 13, and 16) and a rear tie bar 204.

Mounted on studs 210 carried by the plate 201 are rollers 211, upon which bears the inner periphery of the ring gear 196. There are four such bearing rollers 211, as shown in Fig. 16.

Mounted in the plate 202 and extending toward the left, as viewed in Fig. 10, through the bearing 198, is a rod 212. This rod 212 acts as the bearing for the right-hand side of the drum, which carries the tax chart 190.

Secured to the rod 212 adjacent the plate 202 is an arm 213 (Fig. 12), and secured to the left end of the rod 212 is an arm 214 (Fig. 13). The arm 214 is fastened to an intermediate plate 215 by means of a screw 216. The rod 212 extends through the intermediate plate 215. The right end of the rod 212 is threaded to receive a nut 217, and the left end of the rod 212 is threaded beyond the plate 215 to receive a nut 218. These nuts 217 and 218 firmly clamp these parts 214 and 215 together and lock the entire assembly to the plate 202, except for an adjustment which will now be explained. The arm 213 carries a screw 219, which projects through a slot 220 in the plate 202. This screw 219 also projects through an adjusting stud 221, which is supported by a bracket 222 mounted to the plate 202. Lock nuts 223 hold the adjusting stud 221 in the position into which it is adjusted. The purpose of adjusting the arm 213, which, of course, will adjust the rod 212, the arm 214, and the plate 215, will be described hereinafter.

The means for driving the drum will now be described. Meshing with the ring gear 195 is a pinion 226 (Figs. 10, 15, and 16), which is secured to a shaft 227, which has bearings in the side plates 201 and 202. Connected to the left end of the shaft 227 (Fig. 10) is a flexible coupling 228, which is connected to a gear reduction mechanism 229 of a motor 230.

The means for starting the motor, or, in other words,

the means for completing a circuit to the motor, will be described hereinafter.

However, when the motor is energized—and it might be well to state here that it may be operated in both directions—it will, through the gear reduction mechanism 229 and the flexible coupling 228, rotate the shaft 227 and, through the pinion 226, drive the ring gear 195 to rotate the drum mechanism, upon which is mounted the tax chart 190.

#### *Tax chart lamps*

Associated with each of the columns of figures on the chart 190 (Fig. 19) is a lamp. These lamps are adapted to be lighted under control of the bank of Dependents keys during the entry of the number of dependents and the gross pay, and under control of the differential mechanisms associated with the dollars, tens of dollars, and hundred-dollar banks differentials when the operator of the machine makes a sub-total operation of the employee's gross pay, which pay is set up on the amount bank differentials during this sub-total operation, and the amount of movement necessary to set up these amounts under control of the totalizer wheels is transmitted to the selector switches associated with these banks.

A part of these lamps are shown in Figs. 10 and 13, and all of them are shown diagrammatically in Fig. 20-A. There are also two special lamps, one, which is lighted to show a green color whenever there is no tax to be deducted, and another lamp, which shows red when lighted, to indicate that the employee has already received the gross amount of \$3,600.00 and therefore there is to be no more F. O. A. B. tax deducted.

Referring particularly to Figs. 10 and 20-A, there is a lamp 400 associated with the Gross Pay column of figures on the chart 190 (Fig. 19). There are four lamps 401 associated with the four rows of F. O. A. B. insurance contributions. There are two lamps 402 associated with the two columns of city income tax figures, and ten lamps 403 associated with the ten rows of federal income tax figures. There is one lamp 404, which has not been assigned to any particular column in this particular application.

These lamps 400 to 404 are all carried by a lamp holder bar 410 (Figs. 10, 13, and 16), which has an ear 411, by means of which it is attached to the side plate 201 at 412. An arm 416 is also connected to the ear or flange 411 at point 417 to help support the lamp holder bar 410. This arm 416 is rigidly secured to a shaft 418, which is supported by the plate 201 and the plate 215 (Fig. 10). The lamp holder bar 410 also carries two studs 420 (Figs. 13 and 16), which extend between bars 421 and 422, which are rigidly secured to two brackets 424, fastened to the shaft 418.

In order to control the light beams from the lamps 400 to 404, they are all enclosed within a lamp cover 430, which is provided with an opening 431 in its front, so that light is emitted only through this particular opening.

This opening 431 is directly behind a magnifying member 432, which is mounted on the casing or cover 435, which completely encloses the chart drum and the motor of the automatic tax indicator.

The lamp cover 430 rests on a lip 436 of the bar 421. The cover 430, at its right end, is also provided with a clip-like flange 437, which is clipped over the end of the lamp holder bar 410, as shown in Fig. 13. As shown in Fig. 10, the lamp cover 430 is provided on its left end with a lip 438, by means of which it is fastened to the lamp holder bar 410.

Secured to the plate 215 (Figs. 10 and 13) is a bracket 440, and secured to the plate 201 (Figs. 10 and 16) is a bracket 441. Supported by these two brackets 440 and 441 is an L-shaped bar 442, to which is rigidly secured a bar 443. This bar 443 carries electrical terminals 444, one for each of the lamps 400 to 404. The circuits to

complete the lighting of these lamps will be described hereinafter.

Secured to the front of the cabinet 435, as shown in Figs. 11 and 13, is an index 446, which is directly above the opening 431 in the lamp cover 430. On this index are the letters F. O. A. B., City, and the numbers 1 to 9, and 1 to 4 above the numbers 6 to 9. The numbers 1 to 9 indicate the number of dependents which an employee has, and therefore each of these numbers refers to, or is directly above, one of the columns of tax figures, which have been computed on the basis of the number of dependents.

Since there is a lamp for each of the columns of figures on the chart 190 in Fig. 19, and since only the particular lamp is lighted which is relative to the amount of gross pay which the employee earned and depending upon the number of dependents which the employee has and also depending upon the number of cents in the employee's pay and also depending upon whether or not his pay ends in even dollars or odd dollars, only one lamp for the particular row which has been selected under control of these determining factors above mentioned will be lighted, and therefore it will be very easy for the operator to read the amount of F. O. A. B. which is to be deducted, the amount of city income tax to be deducted, and also the amount of federal income tax which is to be deducted from the employee's gross pay.

As an example, the employee's check in Fig. 17 shows that his gross pay was \$116.00. This figure is at the bottom of the Gross Pay column in Fig. 19. Since the pay was \$116.00, the amount of F. O. A. B. or social security which is to be deducted is \$1.74. The amount of city income tax to be deducted is 58 cents, and, since the employee has one dependent, the amount of federal income tax to be deducted is \$18.80. Therefore, in this particular transaction—that is, the writing of the payroll check for the employee whose gross pay is \$116.00—light 400 will be lighted, lamp 401, back of the first column of F. O. A. B. figures will be lighted, lamp 402, back of the first column of city income tax figures will be lighted, and lamp 403 back of the second column of federal income tax will be lighted, and therefore the figures which will show through the opening 431 and be magnified by the magnifying member 432 are those which are shown on Fig. 10 as far as the tax is concerned, the chart having been broken away so that the amount of gross pay does not show. However, it will show in connection with this particular transaction.

There are two other lamps, 433 and 434 (Figs. 20-A and 20-B). The lamp 433 is lighted to indicate green when there is to be no federal tax deduction, and the lamp 434 is lighted to indicate red when the employee's gross pay has reached \$3,600.00, to signal the operator to make no further F. O. A. B. deductions.

#### *Electrical contacts and brush holders*

As has been previously stated, the indicator drum, which carries the tax chart 190, is differentially positioned first to select a group of lines and afterward to select a particular line of a group. After the particular line has been selected, then certain of the lamps are lighted, depending upon the amount of the employee's gross pay, which lamps, as above mentioned, are behind the columns of F. O. A. B. figures, the city income tax figures, and the federal income tax figures, which are based on the gross pay.

Mounted to turn with the drum are certain contacts which are used to complete electrical circuits for line selection purposes.

The electrical contact plates, disks, and slip rings are all mounted on the previously-described insulating disk 197, which, it will be recalled, is a part of the drum upon which the chart 190 is mounted.

Certain of these contact rings are mounted on the inside of the drum on the disk 197, and others of the con-

tact rings are mounted on the outside of the drum, as shown particularly in the sectional view in Fig. 10. The outside, rings are shown in Fig. 15, and the inside rings are shown in Fig. 14.

Mounted on the outside of the drum on the insulating disk 197 are two semi-circular contact plates 450 and 451. Mounted between these plates, as shown in Fig. 15, are two contact plates 452 and 453.

Mounted inside the semi-circular rings 450 and 451 are three full contact or slip rings 454, 455, and 456, all of which are secured to the insulating disk 197.

The purpose and function of these contacts and contact slip rings will be described in connection with the wiring diagram.

Cooperating with the slip rings 454, 455, and 456 (Fig. 15) are brushes 460 (Fig. 10) carried by brush holders 461, 462, and 463, respectively. These brush holders are mounted in a brush holder plate 465, which is secured to the right-hand side plate 202 by means of screws 466.

Cooperating with the contact plates 450, 451, 452, and 453 are brushes 470 carried by brush holders 471, which are fastened in the brush holder plate 465.

There are ten brushes 470 and ten brush holders 471, which are electrically connected to the selector switches associated with the ten-dollar differential. These brushes are connected to all positions zero to nine, as shown in Fig. 12, and also in the wiring diagram (Fig. 20-B).

Secured to the insulating disk 197 on the inside of the drum are three contact or slip rings 475, 476, and 477 (Fig. 14). The slip ring 477 is provided with a series of contacts 478.

Also carried by the inside of the insulating disk 197 is another ring 479 having contact plates 480 arranged alternately between the contact plates 479 of the slip ring 477. These contact plates 478 and 480 are completely and fully electrically insulated one from the other. Cooperating with the slip rings 475, 476, and 477 are brushes 490, carried by brush holders 491, 492, and 493, respectively, which in turn are carried by a brush holder plate 495, which is rigidly secured to the previously-described plate 215 by means of screws 496.

Cooperating with the contact plates 478 and 480 are brushes 497, carried by brush holders 498, which are supported in the brush holder plate 495. There are five brushes 497 associated with the differential mechanism, which in turn is associated with the dollar bank of keys, and these brushes 497 are coupled in pairs, as indicated in Fig. 13 and also in the wiring diagram in Fig. 20-D.

The entire brush holder plate and the auxiliary plate 215 are adapted to be adjusted by the adjusting bolt 221 to establish proper relationship between the brushes 497 and the contact plates 478 and 480.

All of the slip rings which have been described and which are shown in Figs. 14 and 15, and their respective brushes, shown in Figs. 12 and 13, are shown diagrammatically in the wiring diagram in Figs. 20-B and 20-C, and their proper electrical connections to complete the proper circuits selected under control of the differential mechanisms when the operator makes a gross pay operation, which, as above described, is a sub-total operation, to cause the differentials of the amount banks to be set under control of the amount which is in the cross-footer, which amount at that particular time is the employee's gross pay, which may be a regular pay by itself or a regular pay with additional pays, such as vacation pay or bonus pay added to the regular pay. However, at the time the operator makes the gross pay operation, the differentials are set differentially according to the amount of gross pay which is in the cross-footer at that particular time, and it is the differential setting of these differentials which control the selector switches which are illustrated in Fig. 3 to in turn control the electrical circuits to select the proper group of lines and then the proper line in the group, and finally complete circuits

to the proper lamps so that the proper columns of O. A. B. figures, city income tax figures, and federal income tax figures will be lighted for the operator to see readily, so that those particular deductions, based on a definite fixed percentage of the employee's gross pay, may be properly deducted from his gross pay, so that a proper record may be kept in the machine and the proper amounts printed on the employee's pay check, so that, when he gets his net pay, he will know that the net pay is the proper amount, which represents his gross pay minus all of his deductions.

He may have other deductions in addition to tax deductions, which deductions are fixed, regardless of his pay, and those deductions are not shown on this tax-indicating chart. However, such deductions are illustrated in Fig. 17 on the facsimile of the pay check which is adaptably printed by the machine embodying the present invention.

#### *Mounting for Automatic Tax Indicator*

The entire automatic tax indicator is supported in a sub-base 500, which is shown partly broken away in Fig. 18 and also in Fig. 12. This base carries two rectangular studs 501, having round pilots 502, which are adapted to project into holes in the base 200 of the tax indicator. There is secured to the rear of the base 500 a threaded bolt 503, upon which there is a knurled adjusting nut 504 having a shoulder 505. This shoulder 505 projects into a forked bracket 506, which is rigidly secured to the back of the cabinet 435 of the tax indicator.

By turning the adjusting nut 504 up or down, it can be clearly seen that the entire tax indicator can be tilted on the pilots 502 of the supporting studs 501.

It may be desirable to move the tax indicator longitudinally of the machine or even turn it at an angle relative to the front of the machine, depending upon the exact position at which the operator sits, to make it more comfortable for the operator to read the figures at the reading line through the magnifying member 432. Consequently, the sub-base is provided with a pair of slots 510 (Fig. 18).

Secured to the top of the machine cabinet 152 is a platform 511 (Figs. 11, 12, and 18), which has a pair of slots 512 running at right angles to the slots 510.

Where each of the slots 510 and 512 cross, there projects a stud 515. Mounted on the stud, as shown in Fig. 12, are three washers 516. Between the washers, and of a diameter to ride in the slots 510 and 512, are collars 517. A spring clip 518, shown in Figs. 12 and 18, holds the assembly of washers 516, collars 517, and the stud 515 in the position shown in Fig. 12.

With this arrangement it can be clearly seen that the sub-base, and along with it the entire automatic tax indicator, may be moved from side to side as viewed in Fig. 11—that is, from left to right, or right to left—limited, of course, by the length of the slots 510, and at the same time may be turned on any desired angle relative to the slots 512, which are in the platform 511, which, as above mentioned, is rigidly secured to the machine cabinet 512.

There is enough clearance between the washers 516, the sub-base bottom 500, and the platform 511 to allow for any tilting adjustment necessary, which, as above mentioned, may be accomplished by turning the adjusting nut 504 on the bolt 503.

#### *Electrical circuits involved in the operations made by the machine for the writing of an employee's payroll check*

Let us assume that a check like the one shown in Fig. 17 is being written for an employee by the name of Richard Roe.

In writing the check, first the employee's earnings-to-date are picked up and entered in the machine. Next, the federal income tax is picked up, and on the next operation the city income tax is registered, and in the final pickup operation the amount of the F. O. A. B. is registered.

In the next operation, the number of dependents, which in this particular case is one dependent, the No. 1 key 59 will be depressed, and the amount keys 61 for \$116.00, which is the employee's gross pay, will be set up on the machine. The machine will be released for operation now by the depression of the gross earnings key 67 in the 9 position of row 4.

During this operation, the following circuits are either completed or set up to be later completed during the taking of the sub-total of the employee's gross pay, which operation is occasioned by the depression of the Gross key 62 in row 1.

During the operation of entering \$116.00, a circuit is completed from the 48-volt power source (Fig. 20-D) over line 520 to point 521 (Fig. 20-C) over line 522 to point 523 over closed timer switch A, line 530, to contact 162 in the total row through wiper 163 of this row, through the zero contact 161, over line 531 (Figs. 20-D and 20-C), through the switch key 9, row 4, which was closed upon the depression of the Gross earnings key 67 in the ninth position of row 4, and thence to contact 160 in the dependent's row selector switch, through wiper 163, which at this time is contacting the No. 1 contact 161, due to the fact that the one key has been depressed, over line 532 (Figs. 20-C and 20-A), through operating contact 533, to relay R-5 coil, and thence to the ground. This causes an operation of relay R-5, which closes the three sets of normally opened contacts 534, 535, and 536, and at the same time opens the contact 533. The closing of contacts 534 establishes a holding circuit over the holding wire 537 (Figs. 20-A and 20-B), through the normally closed contact 538 of relay R-16 and thence over line 539 (Figs. 20-A and 20-C) back to the power source of 48 volts and thence to ground.

Depression of any of the operating keys in rows 1 to 4 closes a switch 524 (Fig. 20-D), which completes a circuit from the 115-volt power source (Fig. 20-B) through normally closed contact 525, line 526, solenoid 527, switch 524 to the ground, thus tripping and releasing the machine for operation, as shown in application for Letters Patent Serial No. 139,848, filed January 21, 1950, by Pascal Spurlino, Alfred G. Kibler, Rudolph J. Moser, and Eugene H. Wolf, which issued into United States Patent No. 2,639,857 on May 26, 1953.

The setting up of the \$116.00 and the operation of the Gross earnings key 67 in position 9 of row 4 during this operation control none of the circuits. However, since this \$116.00 represents in this case the total gross pay, the next thing for the operator to do is to take a sub-total operation by depressing the Gross key 62 in row 1. The depression of this key, as above mentioned, causes a sub-total operation of the crossfooter and sets up in the differentials of the amount banks, namely, in the \$100.00, \$10.00, \$1.00, dime, and penny banks, positions on those differentials which depend entirely upon the position of the crossfooter, which had in it \$116.00. In other words, the \$100.00 differential is moved to the 1 position, the \$10.00 differential to the 1 position, the \$1.00 differential to the sixth position, the dime differential to the zero position, and the penny differential to the zero position. During this operation, the following circuits are established:

During this operation, the differential of row 1, of course, stops in the 3 position of that differential, which positions the wiper 163 into the third position, so that the circuit is completed now from the 48-volt power source over line 520 to point 521 line 522 to point 523, then through timer switch D, line 540, to contact 162-S of the total row, over wiper 163, contact 161, in the third position, through line 541, to line 542.

From the junction of lines 541 and 542 several circuits are completed as follows: First to the left-hand \$100.00 selector to its contact 162, through wiper 163 and contact 161 in the 1 position, thence over line 543 (Figs. 20-C

and 20-D) to relay R-19 (Fig. 20-B) and thence to the ground. This causes operation of relay R-19.

At the same time, a circuit is completed from the junction of lines 541 and 542 to the right-hand \$10.00 bank selector through its contact 162 over its wiper 163, which is now in the 1 position, and, since there is no wire from this position, the circuit stops at this point at this time.

A circuit is also completed from the junction of lines 541 and 542 to the contact 162 of the next to the right-hand \$10.00 bank selector, through its wiper 163 over contact 161, which at this time is in contact with the wiper 163, over line 545 (Figs. 20-D and 20-B) to brush 470 over ring contact 450, to slip ring 476, which is shown in Fig. 14, through brush 492, over line 546, to switch 547, which is now closed, since relay R-19 has been operated as previously described. From switch 547 to line 548, to point 549. From point 549 the circuit continues over line 550 to relay R-20 and thence to the ground, thus causing an operation of relay R-20, which closes both sets of switches 551 and 552.

The circuit continues over the now closed set of switches 551, which completes a circuit from the 115-volt power source, as above mentioned, through the closed set of switches 551, over line 553, which completes the circuit to the motor 230 in such a manner as to cause the motor drive to drive the drum counter-clockwise.

To make the circuit complete through the motor, it carries on from the motor through line 554 over contact 555, line 556, over the main supply switch 558, to the 115-volt power source ground. This switch 558 is a manual switch operated at the beginning of a payroll run to furnish 115-volt power for the operation of the tax indicator.

The motor 230 now drives the indicator drum counter-clockwise until the contact 453 contacts the brush 470, which has been previously energized through the \$10.00 differential having been stopped in the first position.

The circuit is now completed, after the drum has reached this position, from contact 453 over slip ring 475 (see also Fig. 14) thence over brush 490, line 560, to contact 561, which was operated by the energization of relay R-19 in the manner previously described. This completes the circuit over this contact 561, over line 562, through contact 563 to relay R-23 and thence to the ground, thus causing an operation of this relay R-23.

The operation of relay R-23 pulls up a set of switches 564, which completes the holding circuit back to the holding wire 537 to hold relay R-23 in an operated condition.

The operation of relay R-23 also closed a set of switches 565 and completed the circuit from point 569 on line 562, back over line 566 (Figs. 20-B and 20-D) to the contact 162 of the right-hand dollar bank selector switch shown in Fig. 20-D.

It will be remembered that the employee's gross pay in the example under consideration is \$116.00, and therefore the dollar bank differential has gone to the sixth position. Thus a circuit is completed from the contact 162, wiper 163, contacts 161 numbered 6 and 7, which are tied together by a single wire, over wire 567 to brush 497, and thence to the contact 480, to slip ring 455 and from slip ring 455 to the brush 460 in the holder 462. From the brush 460, the circuit continues back over line 568 (Figs. 20-B and 20-D) to contact 570, closed because relay R-18 has not been operated, back to point 549, thence up and over line 550 to the relay R-20, which causes the drum to still move counter-clockwise. Also upon the operation of relay R-23, the set of contacts 555 was opened, and the circuit continued from line 556 through the 100-ohm resistor back to the motor, which caused a slowing up of the motor drive, which reduces the speed of the drum to such an extent that it materially aids in the rapid selection of the particular line of the group of lines.

It has been described above how the drum is rotated

still in a counter-clockwise direction but at a much slower speed. However, the speed is not slow enough to cause it to stop instantly that the contact 480 leaves the brush 497, and consequently the adjacent contact 478 will contact the brush 497, which will complete the following circuit: from the brush 497 to contact 478, over slip ring 477, brush 493, over line 575 (Figs. 20-B and 20-D), over a set of contacts 576 for relay R-18, which has not been operated, and thence over line 577 to point 578, then over line 579 to the drum release button 580, which is normally closed, thence to relay R-21, which causes an operation of relay R-21, which causes the set of contacts 581 and 582 to close, which completes a circuit from the line 115-volt power source through a set of contacts 581 over line 584, to the winding on the other side of the motor 230, which causes the motor to drive in a clockwise direction. At this time, the 100-ohm resistor is still in the circuit, and the motor will drive slowly clockwise and perhaps carry the contact 578 back past the brush 497, so that the brush may again contact the contact 480, which would reverse the direction of the drum. The operations of first relay R-20 and then R-21 eventually cause the drum to come to a position of rest whereupon the brush 497 is contacting the insulating disk 197 between the two plates 478 and 480, thus preventing either relay R-20 or R-21 from operating.

If for any reason both relays R-20 and R-21 are operated simultaneously, the operator operates the drum release button 580 to release relay R-21.

From the above description it will be clear that the indicator drum with the indicator tax chart thereon has been so positioned that the line opposite the \$116.00 gross pay is directly behind the opening 431 in the lamp housing 430, so that, when the lamps are lighted, the figures in the proper selected columns can be readily seen by the operator through the magnifying member 432.

When gross pays, other than the specific example of \$116.00, are the controlling amounts, then circuits may be over the contacts 451 and 452 and slip rings 454, 455, and 456 to control the turning of the drum to select other groups of lines from the \$10.00 selector switches, and other circuits may be over the slip rings 475, 476, and 477 and the contacts 478 and 480 to control the selection of a line from the selected group of lines.

During the time of the positioning of the drum under control of these relays R-20 and R-21, the switch 552 or 582 is closed, depending upon which of the relays R-20 or R-21 is operated in the manner previously described. This completes a circuit from the 48-volt power source over either the switch 552 or 582, depending upon which relay is operated at that particular time, to a point 590 and thence over line 591 (Figs. 20-B and 20-D) through a rectifier 592, to charge a condenser 593. The charge in this condenser is then used to operate relay R-22. The operation of relay R-22 opens contact 525, thus preventing any release of the machine by a depression of any of the operating keys, which would close switch 524, thus effecting the circuits through the selectors which control the drum, and therefore would possibly cause the drum to stop in the wrong position.

In other words, if the machine were operated before the drum has reached its final position, the operation of the machine will immediately stop the operation of the drum, which would give a false line selection and therefore a false indication to the operator. This, of course, must be prevented, and hence the relay R-22 is provided in this circuit, to prevent any such wrong indication.

At the time the drum is being positioned, the circuit in the example being discussed, which, it will be remembered, is for a gross pay of \$116.00, the \$100.00 selector (the right-hand one in Fig. 20-C) has been moved so that its wiper 163 is contacting the contact 162-S and the contact 161 which does not complete a circuit.

However, the circuit continues on from the junction of lines 541 and 542, to the contact 162 in the extreme

left-hand dollar bank selector over wiper 163, over contact 161, in the sixth position, due to the fact that the dollars differential went to the sixth position, thence over line 601 (Figs. 20-C and 20-A) over closed contact 602, which causes operation of relay R-1. Relay R-3 is tied in with relay R-1 over line 603, and consequently, when relay R-1 is operated by the above-described circuit, relay R-3 is also operated. The operation of relay R-1 closes switches 604, which completes the circuit to the holding circuit line 537, thus holding both relays R-1 and R-3.

During the operation of the drum, the following circuit is also completed from the junction of lines 541 and 542, over line 542 to point 605, over line 606, over timer switch C, which is not closed until after the circuit has been completed through the left-hand dollar selector bank, to close the circuit to cause operation of relays R-1 and R-3. From the timer switch C, the circuit continues on to the contact 162 of the dime bank selector over its wiper 163 to contact 161 in zero position. It will be remembered that there were no dimes or pennies in the gross pay under consideration, and therefore this differential mechanism, under control of the totalizer, was not moved, there being nothing in the dime differential. Therefore this circuit continues on from this point over line 607 (Figs. 20-C and 20-A) to contact 608, and thence from there to relay R-2 to the ground, which causes operation of relay R-2. The operation of this relay R-2 now closes contact 609, which completes the circuit to the holding wire 537, thus holding relay R-2.

From the above description of the electrical circuits, the line on the indicator drum has been selected, and all of the proper relays to select the proper lamps in connection with the \$116.00 gross pay have been operated. The only thing necessary now to do is to describe the circuits to light up the lamps which have been selected under control of the \$116.00 gross pay.

In other words, the operation of setting up the employee's gross pay, under control of a sub-total operation, in the manner previously described, by the depression of the Gross key 62 in row 1, has been fully completed, and all circuits are completed except those circuits which are to be operated now to light up the lamps which have been selected under control of the differentials, which in turn were controlled by the gross pay of \$116.00, in the example being given.

The next operation, and the one in which the selected lamps are lighted, is the extension of the employee's earnings to date. The present earnings-to-date involves or includes the prior earnings-to-date plus the \$116.00 gross pay, which is being considered in this transaction. To release the machine for such operation, the operator depresses the "Extension" key 63 in row 1 and the "Earnings-to-Date" key 65 in row 2. The "Earnings-to-Date" key is an operating key and releases the machine. The depression of key 63 in row 1 causes the differential of row 1 to go to the 2 position and completes the following circuit from the 48-volt source of supply over line 520 to point 521, line 522 to point 523, and thence over timer switch A and line 530 to the contact 162 in the total row. The wiper 163, under control of the "Extension" key, has now moved up to the 2 position and contacts the contact 2 to complete the circuit over line 610 over switch 611, which is closed upon operation of the "Earnings-to-Date" key 65. From switch 611, the circuit continues over line 612 (Figs. 20-D and 20-E) to contact 613 and thence to relay R-17 to ground, which causes operation of relay R-17. The operation of this relay closes contacts 614, which completes the circuit to the holding line 537, thus causing relay R-17 to be locked in operated position.

The operation of relay R-17 causes switch 615 to be closed, thus completing the circuit from the 6-volt power source over the switch 615 to point 616.

From the point 616, a circuit is now completed over line 620, over contact 621, which remains in the condition shown, due to the fact that relay R-13 has not been operated, thence over line 622 (Figs. 20-B, 20-D, 20-C, and 20-A), over contact 623, which was closed by the operation of relay R-1, over line 624, over contact 625, which was closed by the operation of relay R-2, over line 626, and thence to the left-hand lamp 401 of the social security group of lamps to the ground. This causes this particular lamp to be lighted, and, since the \$116.00 line was selected by the drum, the amount of social security deduction, \$1.74, will be visible to the operator, due to the fact that the left-hand lamp 401 has been lighted.

At the same time the previously-described circuit was completed, the following circuit was completed from point 616 to point 630, over line 631 (Figs. 20-B, 20-D, 20-C, and 20-A) to point 632. From this point, the circuit is continued over contact 633, which was closed upon the operation of relay R-1, thence over line 634 to the left-hand lamp 402 to the ground, thus causing the left-hand lamp 402, in connection with the city income tax, to be lighted, which will signal the operator that the city income tax to be deducted amounts to 58 cents. From point 632, this last-mentioned circuit continues on over line 635 to lamp 400, and thence to the ground, causing this lamp 400 to be lighted. This lamp, as has been previously described, is directly behind the gross pay column, thus indicating to the operator that the line in which the \$116.00 gross pay has been selected in the manner previously described, under control of the sub-total operation of the employee's gross pay. The following circuit is also completed at this time from point 630 over contact 640 of unoperated relay R-14, thence over line 641 (Fig. 20-A) to point 642 over line 643 (Figs. 20-C and 20-A) over contact 536, which, it will be remembered, was closed by the previous operation of relay R-5, and thence over line 644 to lamp 403 to the ground, this lamp 403 being the one in the second column, which is the column for one dependent in connection with federal income taxes. This circuit causes this lamp to be lighted, so that the operator will be signaled to deduct the amount of \$18.80 from this gross pay of \$116.00, which \$18.80 is the prefigured amount for an employee having one dependent.

By the description of the circuits just described in connection with the gross pay of \$116.00, the drum was turned to select the line in which the \$116.00 amount is shown in the Gross Pay column on Fig. 19. In this same line, the first column of the F. O. A. B. was selected and a lamp lighted behind this column, and the first column of the city income tax was selected and the lamp lighted behind this column, and the second lamp in the dependents' columns of figures was lighted, so that the operator is signaled to deduct the amount of \$1.74 F. O. A. B., 58 cents city income tax, and \$18.80 federal income tax from this gross pay of \$116.00, which amounts are all shown on the facsimile of the check as indicated in Fig. 17.

It might be well to state here that during the operation such as that described, on certain of the relays, as shown in the wiring diagram, there are closed contacts over which circuits are partially completed, but they are not fully completed at this time because they are not involved in connection with the specific amount of the gross pay being considered.

However, under other conditions, such as different amounts of gross pays, some of those particular relays may be operated, and the ones which have been described as having been operated for the past \$116.00 problem may not be operated because they would not necessarily be involved in this particular new circuit in connection with a different gross pay.

The operator now sets upon the amount keys 61 the amounts of the various deductions which have been indi-

cated to her by the lighting of the various lamps, as above described. These amounts are deducted from the employee's gross pay. Any other fixed amounts, such as union dues or hospitalization, or any other types of deductions which this particular employee may have, are at this time deducted from the gross pay. After all deductions have been made, the operator depresses the Net Pay key 62 in row 1, which releases the machine for the final operation of the machine, to complete the writing of this particular employee's payroll check, which under consideration is one with a gross pay of \$116.00.

The depression of the Net Pay key 62 in row 1 causes the differential of row 1 to be set in the 1 position, whereupon a circuit is completed from the 48-volt power supply (Fig. 20-D) over line 520 to point 521 (Fig. 20-C) over line 522 to point 523, and thence over timer switch A to line 530, and contact 162, brush 163 over contact 161, in the 1 position, thence over line 650 (Figs. 20-D and 20-B) to relay R-16 to the ground, causing operation of this relay R-16. The operation of this relay opens the contact 538, thus opening or breaking the circuit through the holding wire 537, thereby releasing all previously-operated relays involved in the particular transaction of \$116.00 gross pay.

In other words, the release of the holding circuit 537 by the operation of relay R-16 permits all of the previously-operated relays to be automatically returned to their normal position, whereupon the machine is in condition for any subsequent necessary operation.

As has been earlier pointed out in this specification, the operation of the Net Pay key 62 in row 1 caused the ejection of this particular employee's clock card from the clock card box, which is, as above mentioned, located on the top of the machine, as shown and illustrated in the above-mentioned Spurlino et al. Patent No. 2,467,704.

The above-described circuits give a complete electrical operation of the selection of the group of lines on the tax indicator chart, the selection of a line from the group, the selection of the proper lamps to be lighted, and finally the lighting of those lamps involved in the writing of one specific payroll check, which, in the example given, was for the gross amount of \$116.00.

There are other circuits which are involved in connection with the present invention, which are controlled, for example, when the gross pay involves amounts of money including fractional parts of dollars, such as amounts up to 33 cents, and then amounts from 34 cents to 99 cents when the employee's pay ends in even dollars, and when it ends in odd dollars the penny bank control runs from \$1.00 to \$1.66 and then from \$1.67 to \$1.99, in order to select the proper social security lamp, of which there are four because, as above described, there are four columns of social security figures.

The amount of gross pay ending in cents and dimes also controls the proper one of the city income tax lamps 402 to be lighted. The circuits for controlling these lamps change on the even and odd dollar amounts. In other words, if the employee's gross pay was, for example, \$70.00, the left-hand lamp 402 would be lighted, and, if his pay was \$71.00, the right-hand lamp 402 would be lighted, so that the proper amount of city income tax would be deducted. There is another circuit which controls the lighting of lamp 433 when the man's gross pay is of such an amount that there should be no federal income tax deducted therefrom.

Another circuit is completed upon the extension of the earnings-to-date when that amount of money involves \$3,600.00 or more. The lighting of the lamp 434 causes a red signal to be visible to the operator, and at the same time the F. O. A. B. key 67 in row 4 is locked against depression.

During the operation of the machine, of extending the employee's earnings-to-date, which involves the depression of the Extension key 63 in row 1, and the "Earnings-to-Date" key 65 in row 2, a circuit is completed at the same

time that the previously-described circuit through switch 611 and line 612 was completed to operate relay R-17. Said circuit is from switch 611 to contact 162 of the thousand-dollar bank over wiper 163, which at this time is contacting the contact 161 in the third position, over line 660 (Figs. 20-D and 20-C) to contact 162-S of the one-hundred-dollar bank selector over wiper 163, which at this time is contacting the contact 162-S with the contact 161 in the sixth position of this bank, over line 661 to point 662. From point 662, the circuit continues over line 663 (Figs. 20-D and 20-B) to contact 664, to point 666 and thence to the coil of relay R-15 back to the ground. This causes operation of relay R-15, which pulls up contact 665, which completes the circuit to the holding wire 537, thus holding relay R-15 in an operated condition.

The current is at the present time to the point 666, and from this point the circuit continues on over line 667 (Figs. 20-B and 20-D) over the normally closed O. A. B. release switch 668, to the 48-volt solenoid 669, to the ground. Operation of this solenoid 669 pulls up the latch 670 to lock the O. A. B. key 67, as shown in Fig. 20-D.

The operation of relay R-15 opens the contact 621 and closes contact 671 over line 672 to the lamp 434, and thence to the ground, causing this lamp 434 to light, which signals a red light to the operator.

The opening of the contacts 621 breaks the circuit over line 622, which was closed to light the lamp 401 associated with the social security, and therefore, by breaking this circuit 622, the lamp 401 which was previously lighted is turned out.

When the operator receives a red light signal by the lighting of lamp 434, there still may be a certain smaller amount of F. O. A. B. to be deducted, and, in order to release the F. O. A. B. key 67, the operator then manually operates the O. A. B. release switch 668, which releases the solenoid 669 and allows the latch 670 to be taken out from under the key 67 by its spring to free the key 67 for operation.

When an employee's gross pay is under \$60.00, the chart variables are in one-dollar steps, and, when it is \$60.00 or over, the chart variables are in two-dollar steps.

Whenever the gross pay, therefore, is under \$60.00, relay R-14 (Fig. 20-B) is operated in the following manner: A circuit is completed from point 605 (Fig. 20-C) over contact 162 of the \$100.00 selector, over wiper 163 in the zero position, over line 675 to the contact 162 of the adjacent \$10.00 bank, over wiper 163, through line 676, which is connected to all contacts 161, 0 to 5, over line 677 (Figs. 20-C and 20-A) to contact 678 (Fig. 20-B), thence to the winding of relay R-14 to the ground. This causes operation of relay R-14, which closes contact 679 and completes the circuit to the holding wire 537.

The operation of relay R-14 opens the previously-described contact 640 and closes contact 674 to complete a circuit from point 630 over 674, over line 680 (Figs. 20-A, 20-C, and 20-A) over contact 681, when the amount is in even dollars, since relays R-1 and R-3 have been operated on even dollar amounts in the manner previously described.

Should the amount of money have been in odd dollars, then relays R-1 and R-3 would not have been operated, and consequently the circuit would have been from line 680 (Fig. 20-A) over contact 683, over line 684 to point 685, over line 686 to switch contact 535, which was closed by relay R-5 with one dependent, and from contact 535 over line 688 to point 687, and from there to lamp No. 6 to the ground, which lamp No. 6 is behind the second column of odd figures up in the right-hand section of the chart in Fig. 19, thus lighting this lamp when there is one dependent and the amount is below \$60.00 and ending in odd dollars.

The last-described operation for circuits for amounts of odd dollars under \$60.00 would be substantially the

same for relays R-4, R-6, R-7, R-8, to control the lighting of the proper lamps 5, 7, 8, and 9 under the number of dependents.

When the employee's gross pay is under \$60.00, relays R-9, R-10, R-11, R-12, and R-13 are operated to close the circuit to the No Income Tax lamp 433 in the following manner. These relays R-9 to R-13 are taken into consideration when the employee has five or more dependents only.

The operation of relay R-14 closed a contact 690 to complete a circuit from point 630 over contact 690 over line 691 to point 692 (Fig. 20-C). From point 692, the circuit is connected to the middle sets of contacts of all relays R-9 to R-13 inclusive. Thus a circuit, when any one of these relays is operated, is completed to point 694, and from that point over line 695 to the No Income Tax lamp 433 and thence to the ground.

Whenever this lamp 433 is lighted, a green light is signaled to the operator, so that no income tax is to be deducted. Similarly, at that time none of the lamps behind any of the "Dependents" columns 0 to 9 are lighted, because, when the amount is under \$60.00 and there are five or more dependents, no circuits are completed to any of those lamps.

When the gross pay is \$60.00 or under and ends in even dollars, the operation of relay R-3 completes a circuit over the 681 contact, line 682 to point 642. From point 642, the circuit is connected to the bottom sets of contacts of all relays R-4, R-5, R-6, R-7, and R-8, inclusive. Thus, when any of these relays is operated, a circuit is completed to lamps 403 (0, 1, 2, 3, and 4) of the federal income tax columns.

When the gross pay is under \$60.00 and ending in even dollars, for 0 to 4 dependents, the 0 to 4 lamps 403 are lighted. When the gross pay is under \$60.00 and ends in odd dollars, for 0 to 4 dependents, the 5 to 9 lamps 403 are lighted.

When the employee's pay ends in odd dollars and pennies up to 66 cents, relay R-2 is operated by the following circuits.

From the previous description, it will be recalled that, whenever line 607 is energized, relay R-2 is operated in the manner previously described, and therefore, in connection with the circuits now to be described, they will be traced from their source only to the line 607. When the amount ends in 30 cents, the dime bank differential wiper 163 completes a circuit from the contact 162 to the third contact 161 over line 700 (Figs. 20-C and 20-A) to closed contact 701 of unoperated relay R-3, and thence to line 607 to operate relay R-2.

When the amount is 40 or 50 cents, a circuit is completed from contact 162 over wiper 163 to the contact 161 in the 4 or 5 position, over line 702 to contact 703 of unoperated relay R-3 to line 704, and thence to the line 607, which operates relay R-2.

When the dime bank differential wiper 163 is on the contact 161 in the No. 6 position, the circuit is completed from 162 contact over wiper 163, contact 161 in the sixth position, over line 705 to closed contact 706 of the unoperated relay R-3, and thence over line 707 back to line 708 to the contact 162 of the penny bank, and, if the amount is even 60 cents or up to 63 cents, the circuit then goes from the contact 162 of the penny bank over its wiper 163 through line 709 over line 710 to point 711 on the line 607, which again goes to the relay R-2 to operate the same.

Should the penny bank have been standing in the 4, 5, or 6 position, with its wiper 163 in any of those three positions, a circuit is completed from this penny bank, contact 162 over the wiper 163, and contact 161 in the 4, 5, or 6 position over line 715 (Figs. 20-C and 20-A) over closed contact 716 to line 704 and thence to the line 607, which operates relay R-2.

Since points 7, 8, and 9 in the dime bank selector and points 7, 8, and 9 in the penny bank selector have no

electrical connections when the differential goes to these positions, the relay R-2 will not be operated.

As has been earlier described in connection with the circuit diagram, when the amount of gross pay ends in even dollars, the relays R-1 and R-3 are operated, and at this time, should the dime bank be in any position 0, 1, or 2, the circuit will be completed through the contact 162, wiper 163, and directly to the line 607 to operate the relay R-2 under this condition.

Since relays R-1 and R-3 are now operated, the pennies bank differential up to three cents will complete the circuit through line 710 to point 711, and in the dimes bank the circuit will be completed over the line 700 through switch 721 over line 708 and thence back to the penny bank contact 162, which then will complete the circuit up to three cents over the line 710 to the common point 711 on the line 607 to operate relay R-2.

During the operation of relay R-3, the contact 716 was opened, thus breaking the circuit 715 to the contacts 4, 5, and 6 of the penny bank, so that everything above three cents in the penny bank will be inoperative as far as the lamp controlling is concerned.

The operation of R-3 also causes the contact 703 to open, thereby breaking the circuit through line 702, so that the 4 and 5 positions in the dime bank are inoperative to effect any control.

The operation of relay R-3 also opens contact 706, which causes an opening in the circuit line 705 to the sixth contact in the dime bank, thus rendering contact 6 inoperative as far as effective control is concerned. Therefore, with the employee's gross pay ending in even dollars, any amount of 33 cents and below will cause an operation of relay R-2. Any amount above this will not cause any operation of relay R-2, and similarly with odd dollars ending when the amount is 66 cents and below, relay R-2 is operated, and for amounts above 66 cents the relay R-2 is not operated.

The operation of relay R-2 in conjunction with the set of contacts 623 and 723 on relay R-1 controls the lighting of the lamps 401, numbered 1, 2, 3, and 4, associated with the social security of F. O. A. B. columns of figures. With an even amount of dollars and cents up to 33 cents, the No. 1 lamp 401 is lighted, and between 34 and 99 cents, the No. 2 lamp 401 is lighted. On odd dollars, the lamp No. 3—401 is lighted when the pennies run up to 66 cents, and between 67 and 99 cents the lamp 401 associated with the fourth column of social security figures is lighted.

The lamp 1 or 2, 402 in connection with the city income tax columns of figures is lighted, depending upon the position of relay R-1; if relay R-1 is not operated, then a contact 724 completes the circuit to the No. 2 lamp, and if the amount of dollars is even and the relay R-1 is operated, then the contact 633 completes the circuit to No. 1 lamp 402 in the city income tax column.

It might be well to state at this point that the timer switch A of Fig. 20-D and timer switches D and C as shown in Fig. 20-C are operated by cams in the machine at the following times: The timer switch A is closed after the selectors are positioned and opened near the end of the operation. The timer switch C closes after switch A is opened and at about approximately 310 to 355 degrees. The timer switch D is normally closed, and is open all the time the selector switches are in motion, and is again closed at about 150 degrees so as to be normally closed.

Since the operations of all of the mechanical parts in connection with this present invention have been described in connection with the detailed description, no further description of the operation of the mechanical parts is thought necessary at this time.

Likewise it is not felt necessary to go into any further description of the electrical circuits, all of which have been described in sufficient detail to select a group of

lines on the drum and a line from the group, and also to select any of the proper lamps in connection with the F. O. A. B. taxes, the city income taxes, and the federal income taxes, whether the amount be in even dollars or odd dollars and also whether or not the number of dependents is from no dependents to nine dependents.

Circuits have also been described in connection with this invention to point out how the right-hand lamps Nos. 6 to 9 in connection with the federal income tax columns are selected for operation and lighted when the employee has from no dependents to four dependents.

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.

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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a differentially adjustable chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; rotatable cylindrical means for supporting said chart; means under control of said differential mechanisms when the latter are set under control of the differential position of said totalizer in a multiple-cycle operation for rotating said cylindrical means for adjusting said chart for selecting the line on the chart corresponding to the differential position of the totalizer; and means under control of one of said banks of amount determining means for selecting one of said ten federal income tax deductible figures on the chart in its adjusted position.

2. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a differentially adjustable chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security

deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; rotatable cylindrical means for supporting said chart; electrically operated means controlled by said differential mechanisms and by one of said control keys in a multiple-cycle operation to differentially position said rotatable cylindrical means to automatically select the line of figures on the chart corresponding to the gross pay in said totalizer; and electrically operated means controlled by one of said banks of amount determining means to automatically select one of said ten federal income tax deductible figures in line with the selected gross pay on the differentially adjusted chart.

3. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a differentially adjustable chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; a rotatable means for supporting said chart; electrical means controlled by said differential mechanisms when the latter are positioned under control of the differential setting of the totalizer during a multiple-cycle operation caused by one of said control keys, to differentially adjust said chart to select the gross pay figure on the chart which corresponds to the differential setting of said totalizer; and electrical means to select one of the ten federal income tax figures which is in line with the selected gross pay amount on the adjusted chart.

4. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a differentially adjustable chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, then columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; a rotatable means for supporting said chart; electrical means controlled by said differential mechanisms when the latter are positioned under control of the setting of the totalizer during a multiple-cycle operation caused by one of said control keys, to operate said rotatable means to differentially position said

chart to select the gross pay figure on the chart which corresponds to the setting of the totalizer; electrical means to select on the differentially positioned chart, one of the ten federal income tax figures which is in line with the selected gross pay; electrical means to select on said differentially positioned chart, one of the four social security figures in line with the selected gross pay; and electrical means to select on said chart after it has been differentially positioned, one of the city income tax figures in line with the selected gross pay.

5. In a machine capable of single-cycle and multiple-cycle operations involved in complete transactions; 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the setting of one of said totalizers according to the gross amount in said one totalizer; a differentially adjustable chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; a rotatable means for supporting said chart; electrical means controlled by a certain one of the differential mechanisms when the latter are positioned under control of the setting in the totalizer during a multiple-cycle operation to cause differential adjustment of said chart to select a group of gross pay lines on said chart; and electrical means controlled by certain other of the differential mechanisms during said multiple-cycle operation to select a certain line of said group of lines on the differentially adjusted chart.

6. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the setting of one of said totalizers according to the gross amount in said one totalizer; a differentially adjustable chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; a rotatable means for supporting said chart; electrical means controlled by the ten-dollar denomination differential mechanism when the latter is positioned under control of the setting of the corresponding totalizer wheel to cause differential adjustment of said chart to select a group of gross pay lines on the chart; and electrical means controlled by the dollar denomination differential mechanism when the latter is positioned

under control of the setting of the corresponding totalizer wheel to select a certain line of said group of lines on the chart.

7. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the setting of one of said totalizers according to the gross amount in said one totalizer; a differentially adjustable chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; a rotatable means for supporting said chart; electrical means controlled by the ten-dollar denomination differential mechanism when the latter is positioned under control of the setting of the corresponding totalizer wheel to cause differential adjustment of said chart to select a group of gross pay lines on the chart; electrical means controlled by the dollar denomination differential mechanism when the latter is positioned under control of the setting of the corresponding totalizer wheel to select a certain line of said group of lines on the chart; electrical means to select one of the social security figures and one of the city income tax figures in the selected line of the adjusted chart; and electrical means to select one of the federal income tax figures in said selected line of the adjusted chart.

8. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; a rotatable means for supporting said chart; electrical means controlled by said differential mechanisms and by one of said control keys in a multiple-cycle operation to move said chart to select the line of figures on the chart corresponding to the gross pay in said totalizer; electrically operated means to signal to the operator that certain figures in the selected line of figures are to be deducted from the gross pay in said totalizer; and electrical means to signal to the operator that there should be

no deductions made of certain signalled figures and to automatically disable such signal.

9. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; electrically controlled means under control of the differential position of the totalizer and representing the gross pay to move the chart to select a line of figures corresponding to said gross pay; electrically operated means controlled by the differential position of the totalizer to indicate a certain column of a group of columns of figures for deduction when said position of the totalizer is such that it represents an amount which ends in odd dollars and is under \$60.00; and electrically operated means controlled by the differential position of the totalizer to indicate a certain column of another group of columns of figures for deduction when the said differential position of the totalizer is such that it contains an amount under \$60.00 and ends in an even number of dollars.

10. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount-determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; electrically controlled means under control of the differential setting of the totalizer when said totalizer contains the gross pay, to move the chart to select a line of figures corresponding to said gross pay; electrically operated means controlled by the setting of the totalizer to indicate a certain column of a group of columns of figures for deduction when said totalizer setting represents an amount which ends in odd dollars and is under \$60.00; electrically operated means controlled by the setting of the totalizer to indicate a certain column of another group of columns of figures for deduction when said totalizer setting represents an amount under \$60.00 and ends in an even number of dollars; and electrically controlled means

also controlled by the setting of the totalizer to indicate a certain column of a third group of columns of figures for deduction when said totalizer setting represents an amount which ends in even dollars and in cents up to 33, to indicate another column of the third group when said amount in the totalizer ends in even dollars and in cents from 34 to 99, to indicate a third column of said third group when said amount in the totalizer ends in odd dollars and in cents up to 66, and to indicate a fourth column of said third group when said amount in the totalizer ends in odd dollars and in cents from 67 to 99, and to indicate which column of a fourth group of columns depending upon whether said totalizer setting represents an amount which ends in even dollars or odd dollars without regard to the amount of cents.

11. 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 banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount-determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said columns of figures being so arranged that in a horizontal line with each gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; electrically controlled means under control of the differential setting of the totalizer which contains the gross pay, to move the chart to select a line of figures corresponding to said gross pay; electrically operated means controlled by said totalizer to indicate a certain column of a group of columns of figures for deduction when said totalizer contains an amount which ends in odd dollars and is under \$60.00; electrically operated means controlled by said totalizer to indicate a certain column of another group of columns of figures for deduction when said totalizer contains an amount which is under \$60.00 and ends in an even number of dollars; electrically controlled means controlled by said totalizer to indicate a certain column of a third group of columns of figures for deduction when said totalizer contains an amount which ends in even dollars and in cents up to 33, to indicate another column of the third group when said totalizer contains an amount which ends in even dollars and in cents from 34 to 99, to indicate a third column of said third group when said totalizer contains an amount which ends in odd dollars and in cents up to 66, and to indicate a fourth column of said third group when said totalizer contains an amount which ends in odd dollars and in cents from 67 to 99, and to indicate which column of a fourth group of columns depending upon whether the amount in said totalizer ends in even dollars or odd dollars without regard to the amount of cents; and electrical means operated under control of the thousand-dollar and one-hundred-dollar differentials in a multiple-cycle operation when those differentials reach or pass certain positions under control of the earnings-to-date, to operate a special indicator and to render ineffective any selected indicator group of columns.

12. 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 remain-

ing keys control the machine to make multiple-cycle operations; a plurality of banks of amount-determining means; a plurality of differential mechanisms, one for each bank of amount-determining means; a plurality of totalizers selectable by certain of the control keys and operable different extents by the differential mechanisms; a special bank of keys; means to cause a multiple-cycle operation to set the differential mechanisms under control of the gross amount in one of said totalizers; a chart having thereon columns of figures, one column of figures representing gross pay, four columns representing social security deductions based on the gross pay, two columns representing city income tax deductions based on the gross pay, ten columns representing federal income tax deductions based on the gross pay and the number of dependents chargeable against such gross pay, said column of figures being so arranged that in a horizontal line with gross pay there are four social security deductible figures, two city income tax deductible figures and ten federal income tax deductible figures; means for supporting said chart; means under control of said differential mechanisms when the latter are set under control of the differential setting of said totalizer in a multiple-cycle operation for selecting the line on the chart corresponding to the differential setting of the totalizer; and electrical means under control of said special bank of keys for selecting one of said federal income tax deductible figures.

13. In a machine capable of producing payroll checks, said machine involving single-cycle and multiple-cycle operations and having totalizers, banks of number-determining keys, and banks of control keys; a differentially adjustable chart having columns of figures representing gross pays, F. O. A. B. deductions, city income tax deductions, federal income tax deductions, the latter based on the gross pay and the number of dependents, and additional columns of figures representing federal income tax deductions based on gross pay ending in odd dollars under \$60.00 and also based on the number of dependents 0 to 4; electrical means controlled by the setting of the totalizer which contains the gross pay for adjusting said chart to select the gross pay on said chart; electrical means controlled by a certain one of the banks of number-determining keys for selecting the proper income tax deduction; electrical means controlled by the setting of the totalizer for selecting one of the city income tax deductions; and electrical means under control of the setting of said totalizer to select the proper F. O. A. B. deduction.

14. In a machine capable of producing payroll checks, said machine involving single-cycle and multiple-cycle operations and having totalizers, banks of number-determining keys, and banks of control keys; a differentially adjustable chart having columns of figures representing gross pays, F. O. A. B. deductions, city income tax deductions, federal income tax deductions, the latter based on the gross pay and the number of dependents, and additional columns of figures representing federal income tax deductions based on gross pay ending in odd dollars under \$60.00 and also based on the number of dependents 0 to 4; electrical means controlled by the setting of the totalizer for adjusting said chart to select the gross pay on said chart; electrical means controlled by a certain one of the banks of number-determining keys for selecting the proper income tax deduction; electrical means controlled by the setting of the totalizer for selecting one of the city income tax deductions on the adjusted chart; electrical means under control of the totalizer to select the proper F. O. A. B. deduction; and electrical means controlled by the totalizer when the amount in said totalizer is under \$60.00 and ends in odd dollars to select a different income tax deduction.

15. In a machine capable of producing payroll checks, said machine involving single-cycle and multiple-cycle

operations and having totalizers, banks of number-determining keys, and banks of control keys; a differentially adjustable chart having columns of figures representing gross pays, F. O. A. B. deductions, city income tax deductions, federal income tax deductions, the latter based on the gross pay and the number of dependents, and additional columns of figures representing federal income tax deductions based on gross pay ending in odd dollars under \$60.00 and also based on the number of dependents 0 to 4; electrical means controlled by the setting of the totalizer to adjust said chart to select the gross pay on said chart; electrical means controlled by a certain one of the banks of number-determining keys for selecting the proper income tax deduction; electrical means controlled by the setting of the totalizer for selecting one of the city income tax deductions on the adjusted chart; electrical means under control of the setting of said totalizer to select the proper F. O. A. B. deduction; electrical means controlled by the setting of the totalizer when said setting represents an amount under \$60.00 and ends in odd dollars to select a different income tax deduction; and electrical means controlled by the amount of earnings-to-date in a totalizer when such amount is over a certain figure to signal the operator of such fact and to cancel the selection of said F. O. A. B. deduction.

16. In a machine capable of producing payroll checks, said machine involving single-cycle and multiple-cycle operations and having totalizers, banks of number-determining keys, and banks of control keys; a differentially adjustable chart having columns of figures representing gross pays, F. O. A. B. deductions, city income tax deductions, federal income tax deductions, the latter based on the gross pay and the number of dependents, and additional columns of figures representing federal income tax deductions based on gross pay ending in odd dollars under \$60.00 and also based on the number of dependents 0 to 4; electrical means controlled by the totalizer for adjusting said chart to select the gross pay on said chart; electrical means controlled by a certain one of the banks of number-determining keys for selecting the proper income tax deduction; electrical means controlled by the

totalizer for selecting one of the city income tax deductions on the adjusted chart; electrical means under control of said totalizer to select the proper F. O. A. B. deduction; electrical means controlled by the totalizer when said totalizer contains an amount under \$60.00 and ends in odd dollars to select a different income tax deduction; and electrical means under joint control of a certain one of the banks of number-determining keys and the setting of the totalizer to signal the operator that there shall be no federal income tax deduction.

17. In a machine according to claim 14 wherein the last-mentioned electrical means effects a cancellation of the first income tax deduction.

18. In a machine according to claim 13 wherein all electrical controls are cancelled during an operation of the machine initiated by a certain key in one of the control banks.

19. In a machine according to claim 13 including an electrical control effected by operation of a certain key in one of the control banks to cancel all previously set electrical controls.

20. In a machine according to claim 1 including means under control of one key of one of the bank of keys which controls the machine to make multiple-cycle operations to cancel all previous controls.

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