Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

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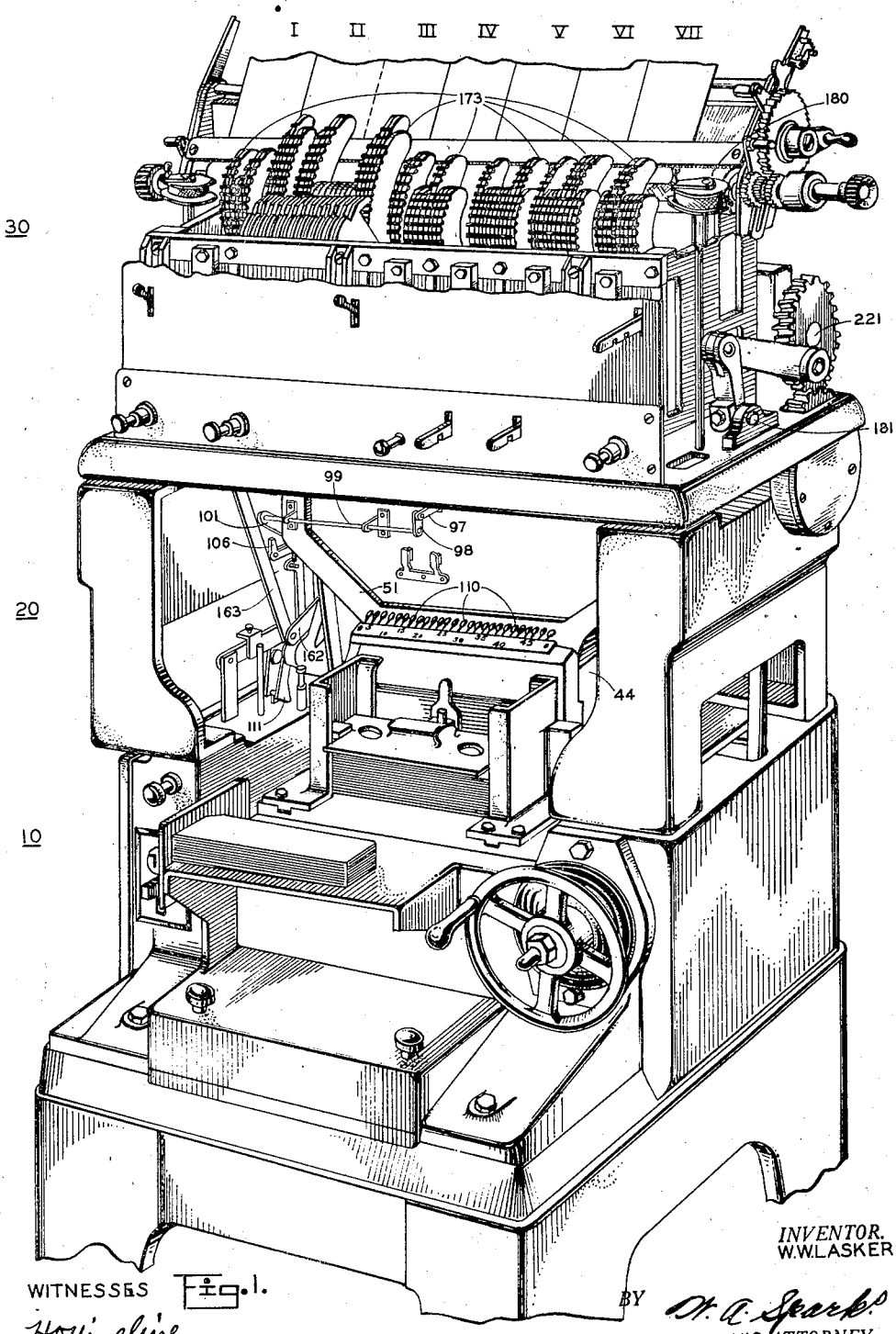


Fig. 1.

INVENTOR.
W.W.LASKER

WITNESSES

H. A. Hineline

A. H. Maschmeyer

BY H. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 2

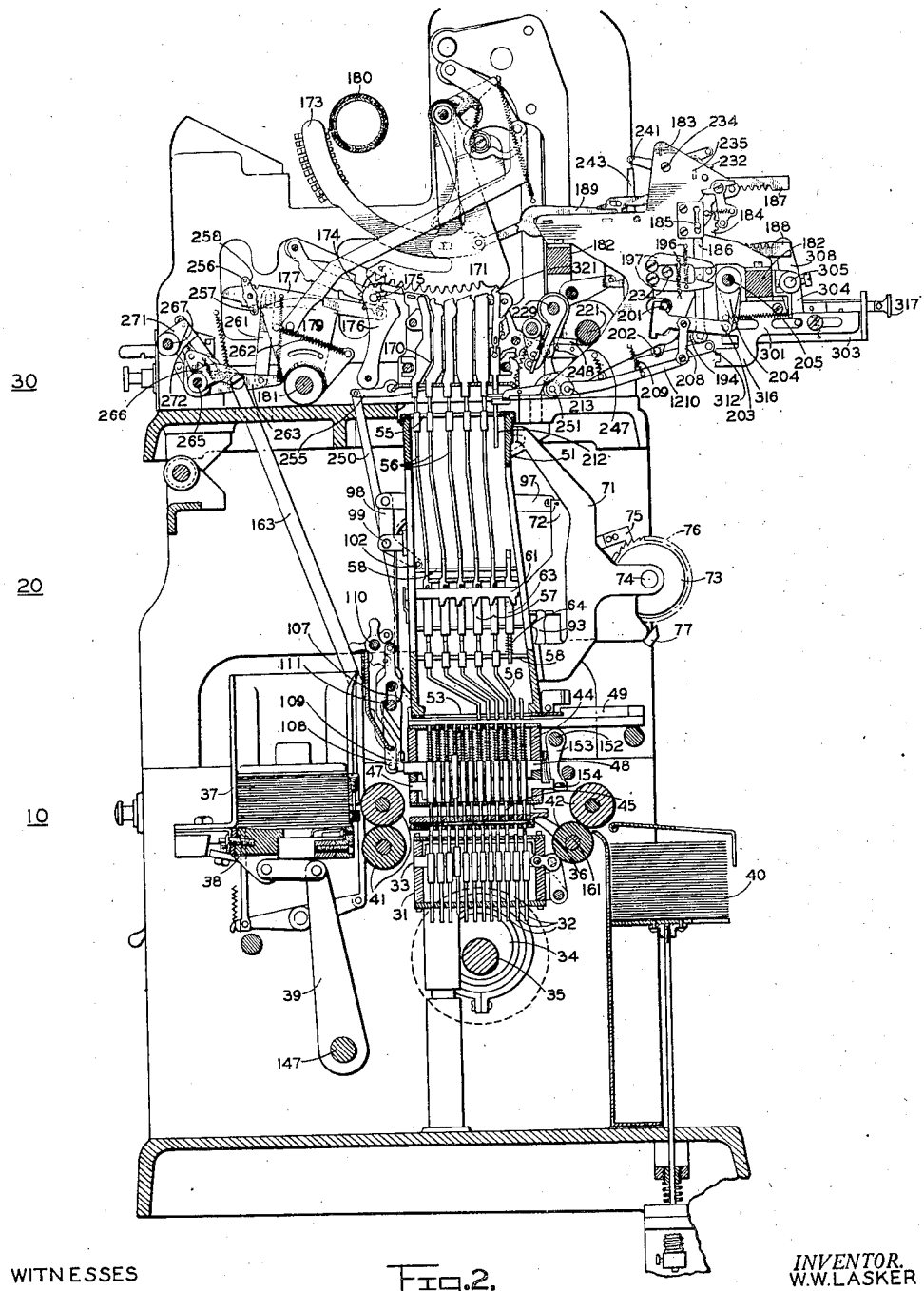


Fig. 2.

WITNESSES

H. D. Hineline

C. H. Maschmeyer.

INVENTOR.
W. W. LASKER

BY F. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 3

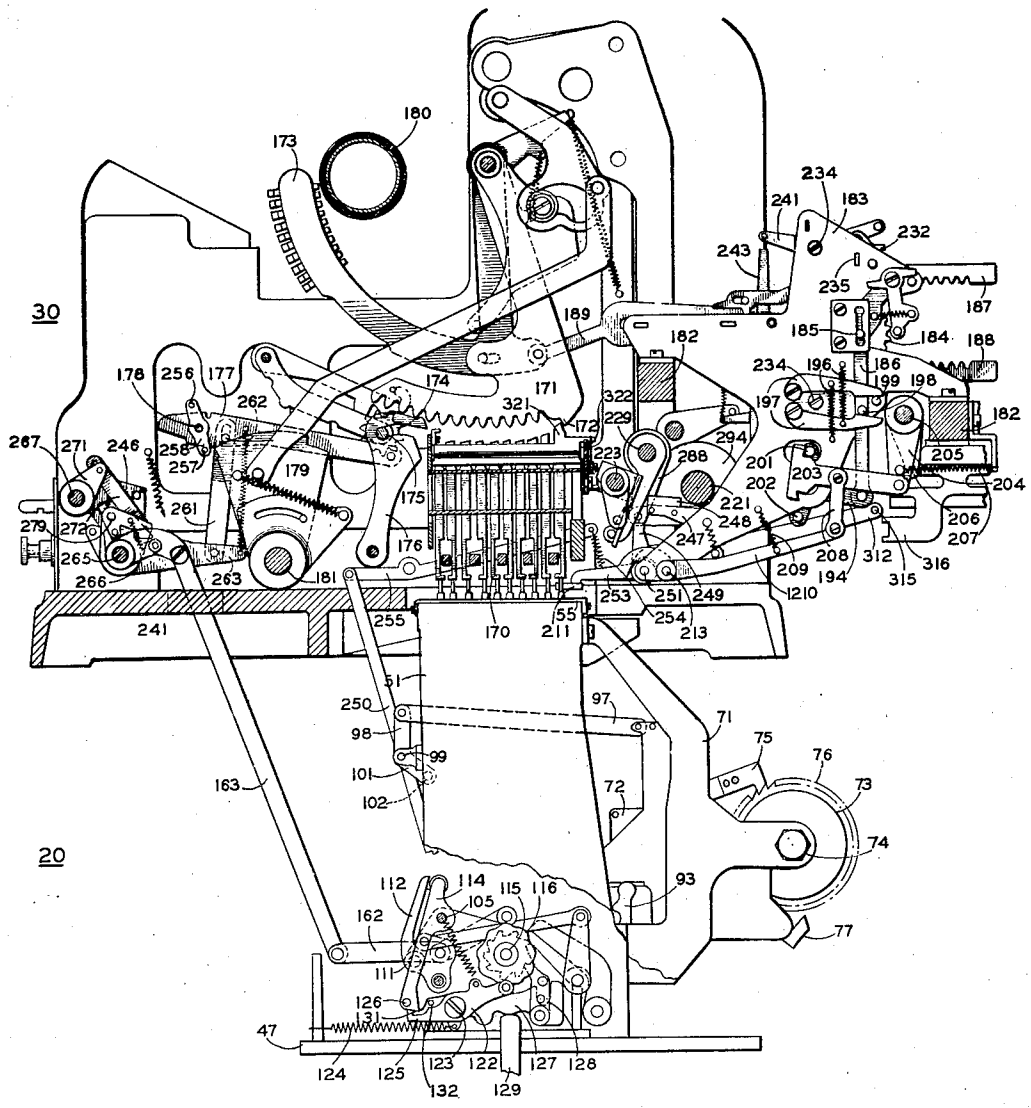


Fig. 3.

WITNESSES

H. D. Hinelline

A. H. Maschmeyer

INVENTOR.
W. W. LASKER

BY W. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 4

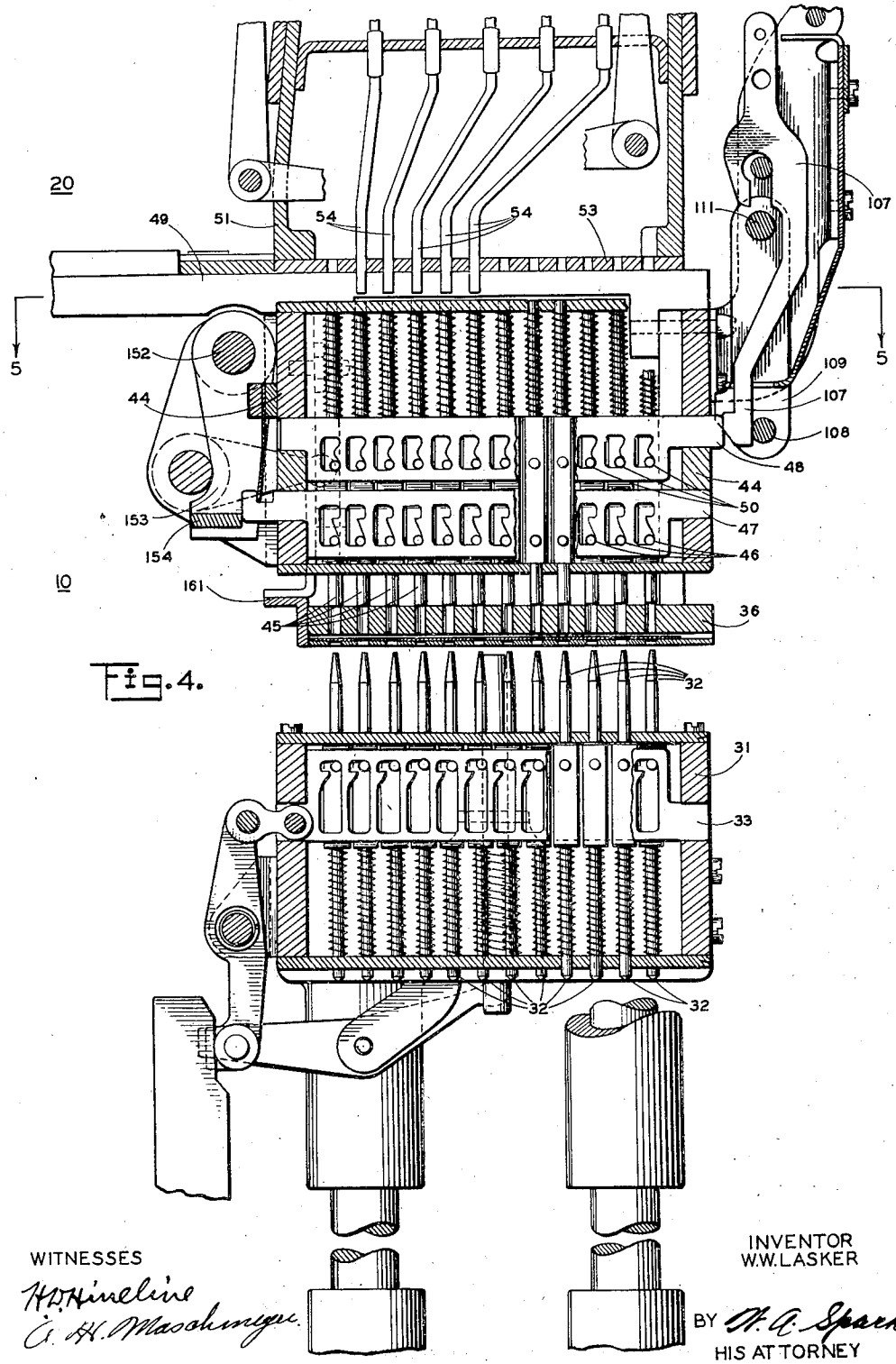


Fig. 4.

WITNESSES

H. D. Hinckley

C. H. Maschmeyer

INVENTOR
W. W. LASKER

BY W. A. Sparks

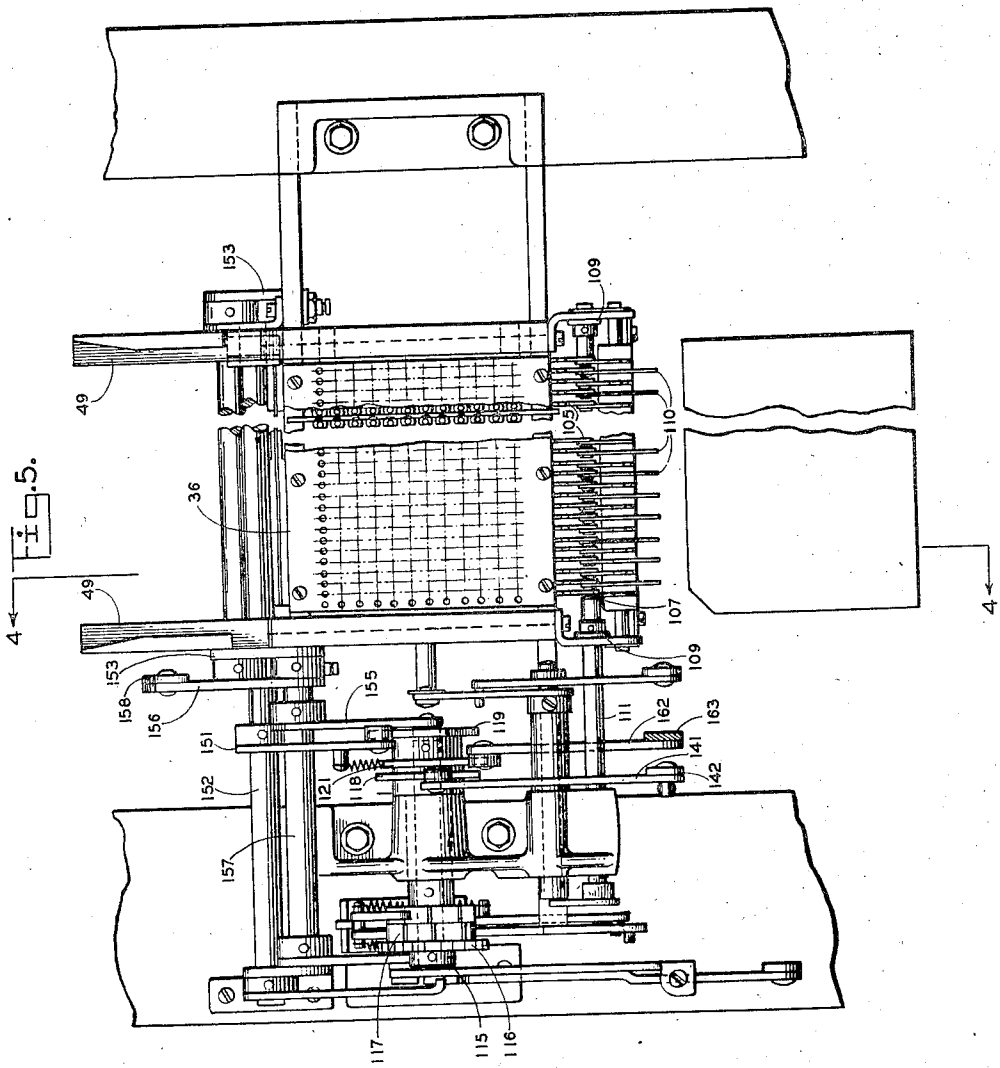
HIS ATTORNEY

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TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 5

Fig. 5.



WITNESSES

H. W. Fineline.

C. H. Moschmeyer.

INVENTOR.
W. W. LASKER

BY H. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 6

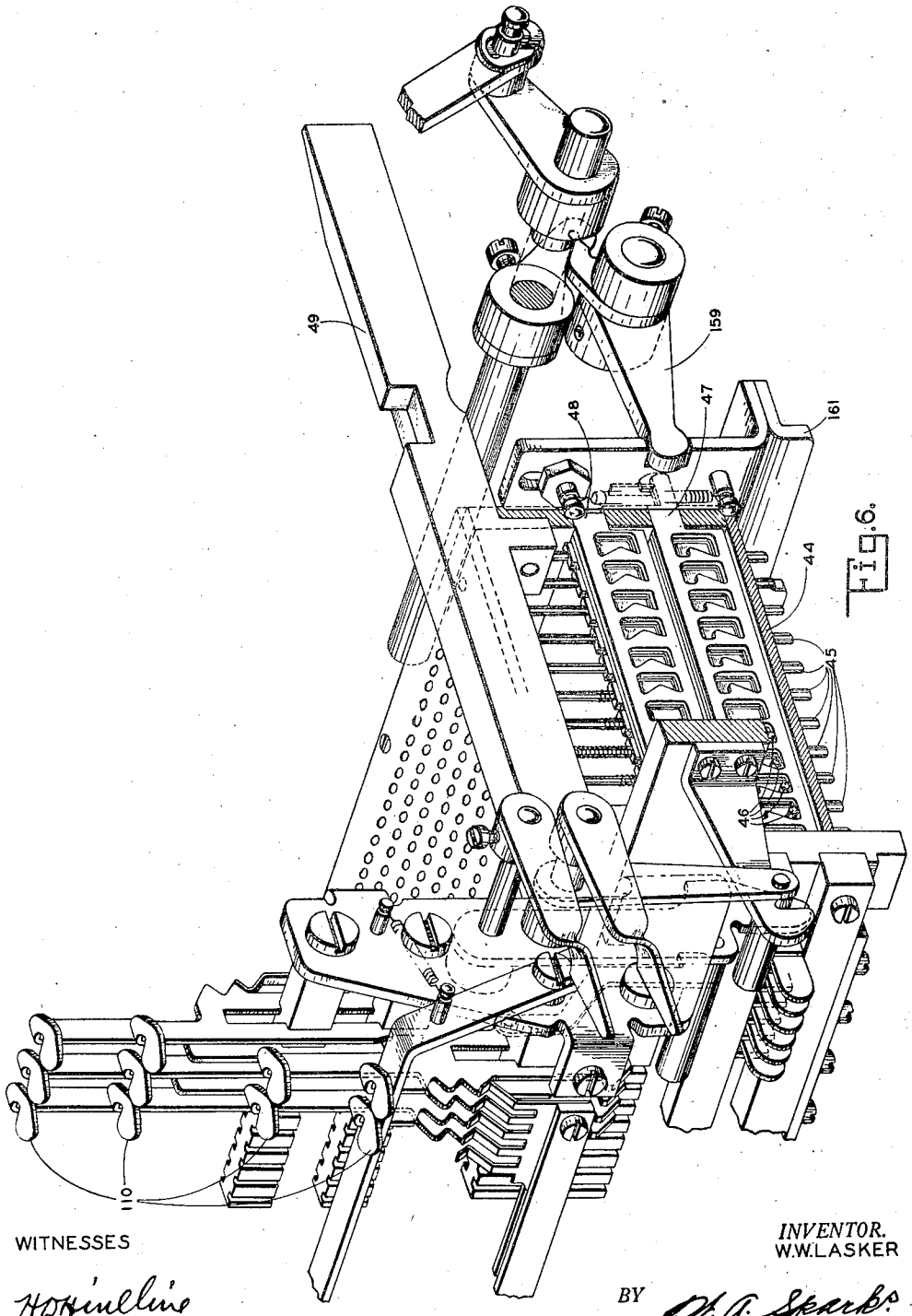


Fig. 6.

WITNESSES

H. Hinelline

A. H. Waschmuyer

INVENTOR.
W. W. LASKER

BY D. A. Spencer

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

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Filed April 28, 1936 24 Sheets-Sheet 7

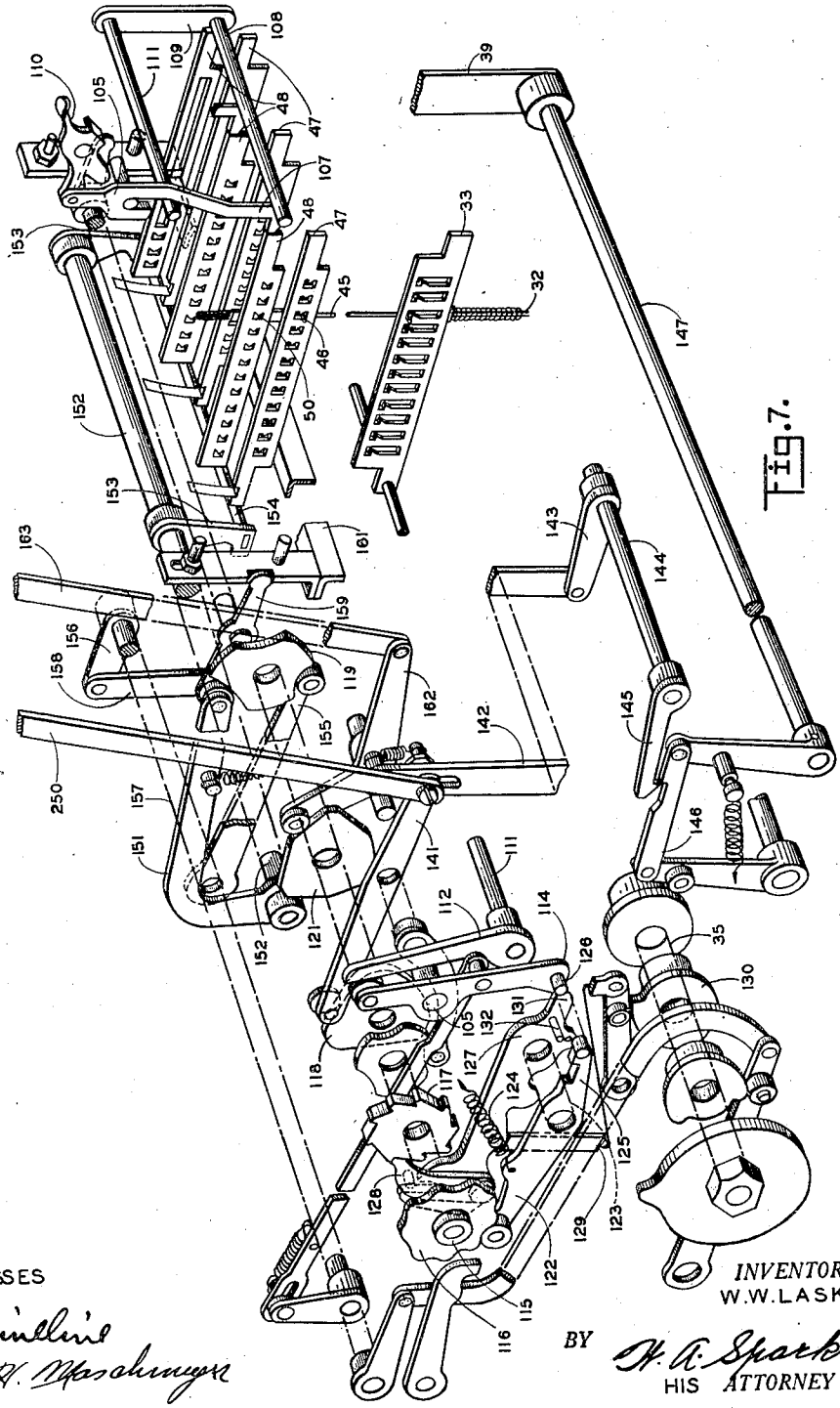


Fig. 7.

WITNESSES

H. O. Hinkline

C. H. Maschmeyer

INVENTOR.
W. W. LASKER

BY H. A. Sparks
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 8

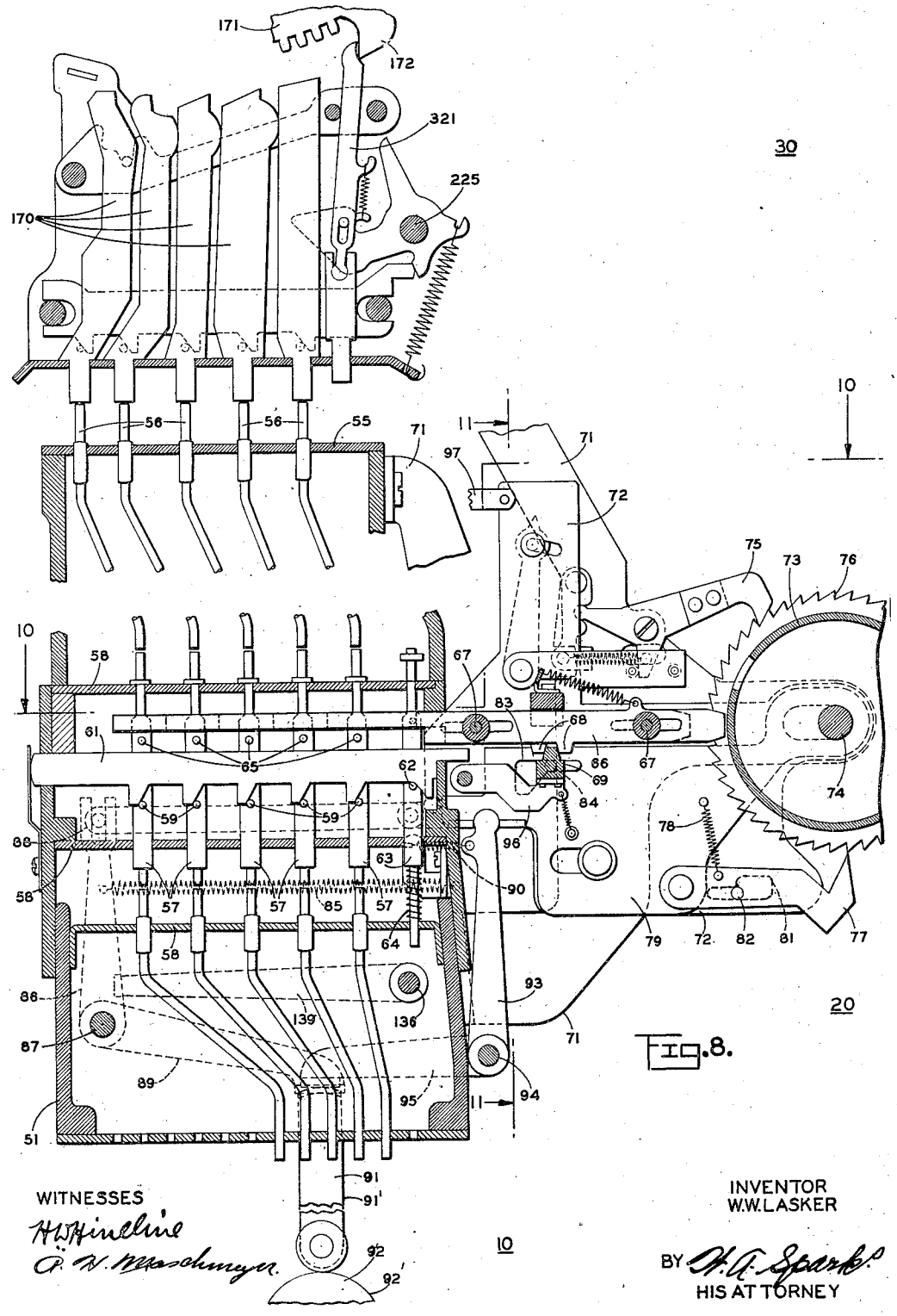


Fig. 8.

WITNESSES

H. J. Hinchline

P. W. Maschmeyer.

INVENTOR
W. W. LASKER

BY H. A. Sparke

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 9

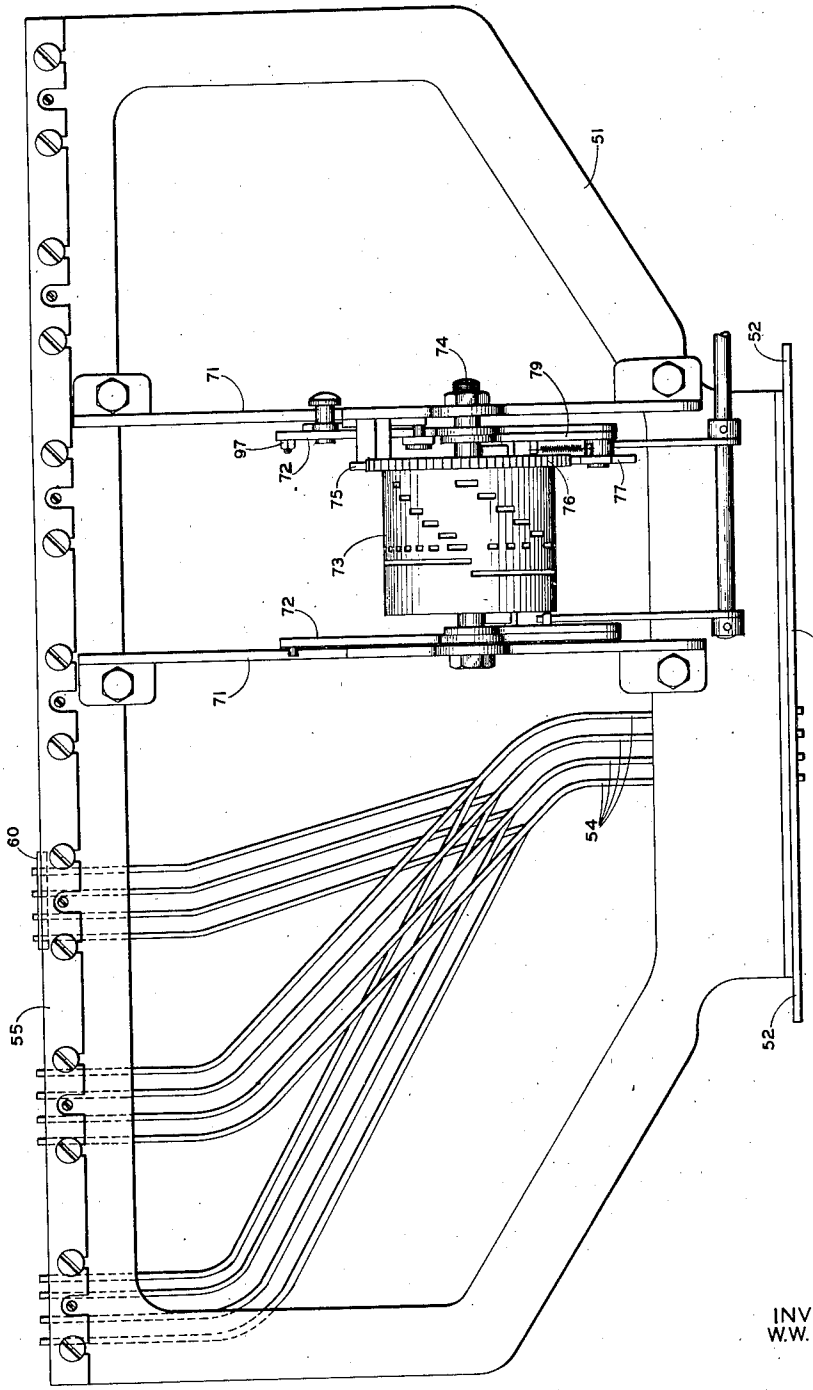


Fig. 9.

INVENTOR
W.W.LASKER

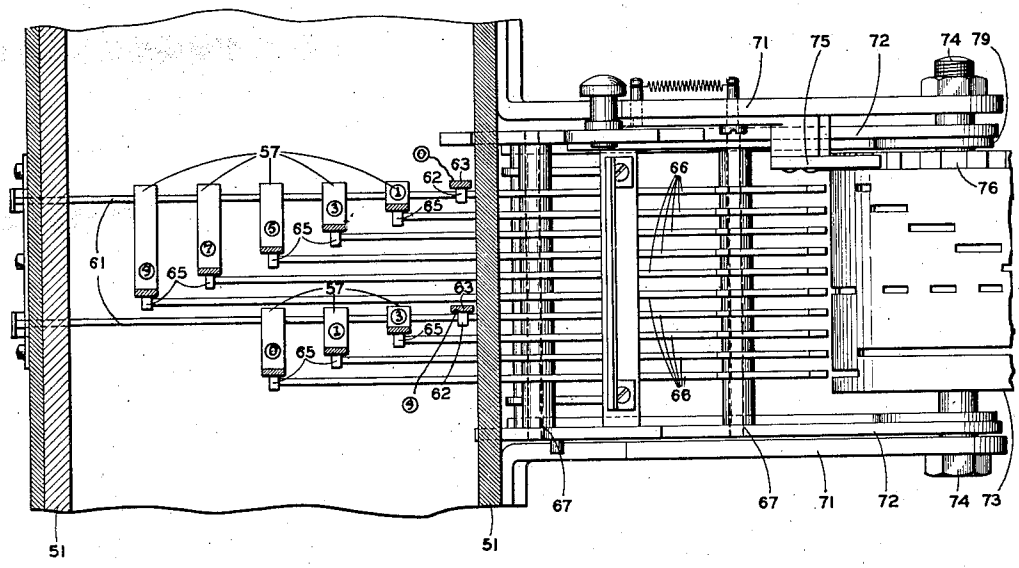
BY W. A. Sparks
HIS ATTORNEY

H. Hinchliffe
A. H. Maschmeyer

Dec. 13, 1938. W. W. LASKER 2,140,136

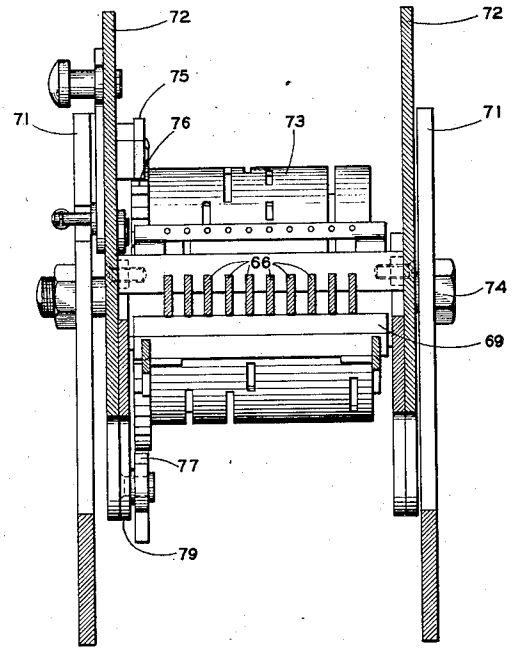
TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 10



20

FIG. 10.



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FIG. 11.

WITNESSES

H. D. Hineline

C. A. Maschmeyer

INVENTOR
W. W. LASKER

BY W. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

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Filed April 28, 1936 24 Sheets-Sheet 11

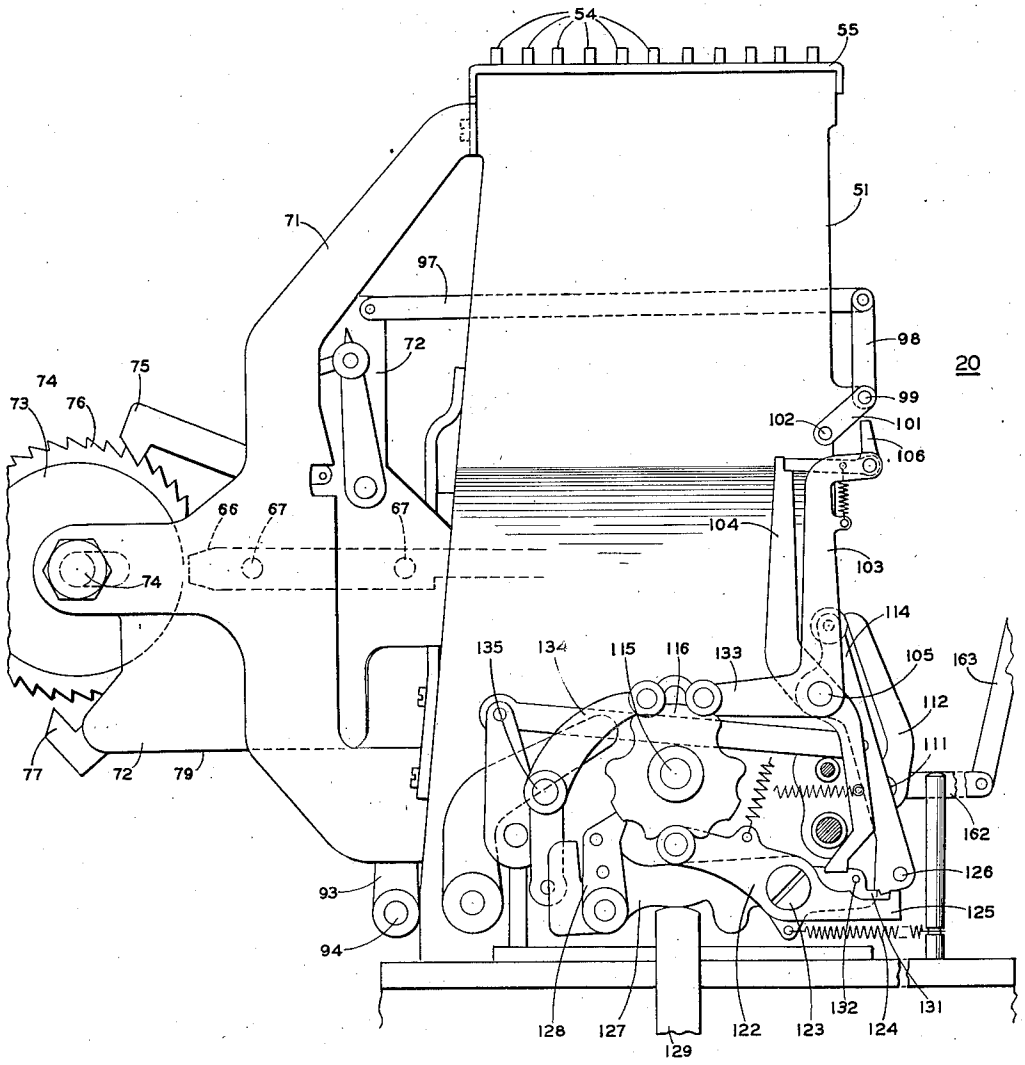


Fig. 12.

WITNESSES

H. J. Hineline

A. H. Maschmeyer

INVENTOR
W. W. LASKER.

BY W. A. Sparks
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 12

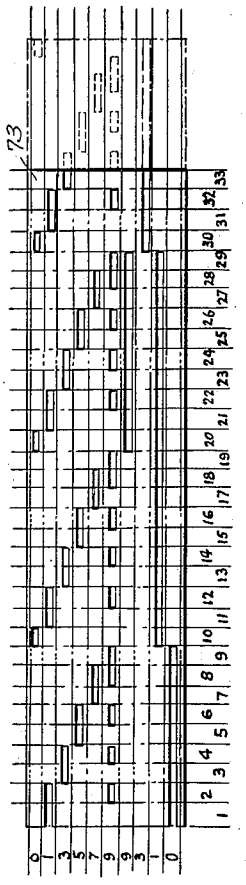


Fig. 14.

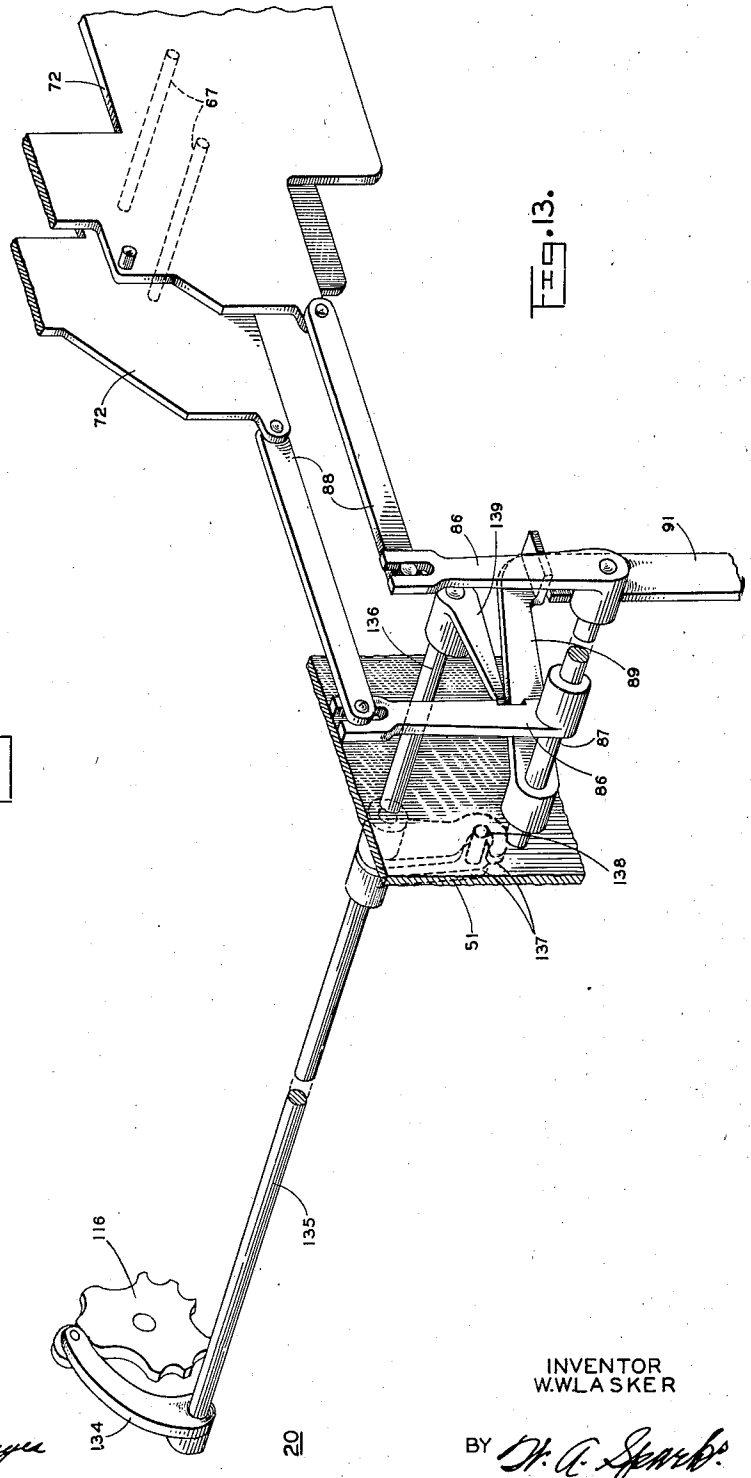


Fig. 13.

WITNESSES

H. D. Hinckins

C. H. Mitschmeyer

INVENTOR
W. W. LASKER

BY W. A. Sparks
ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 13

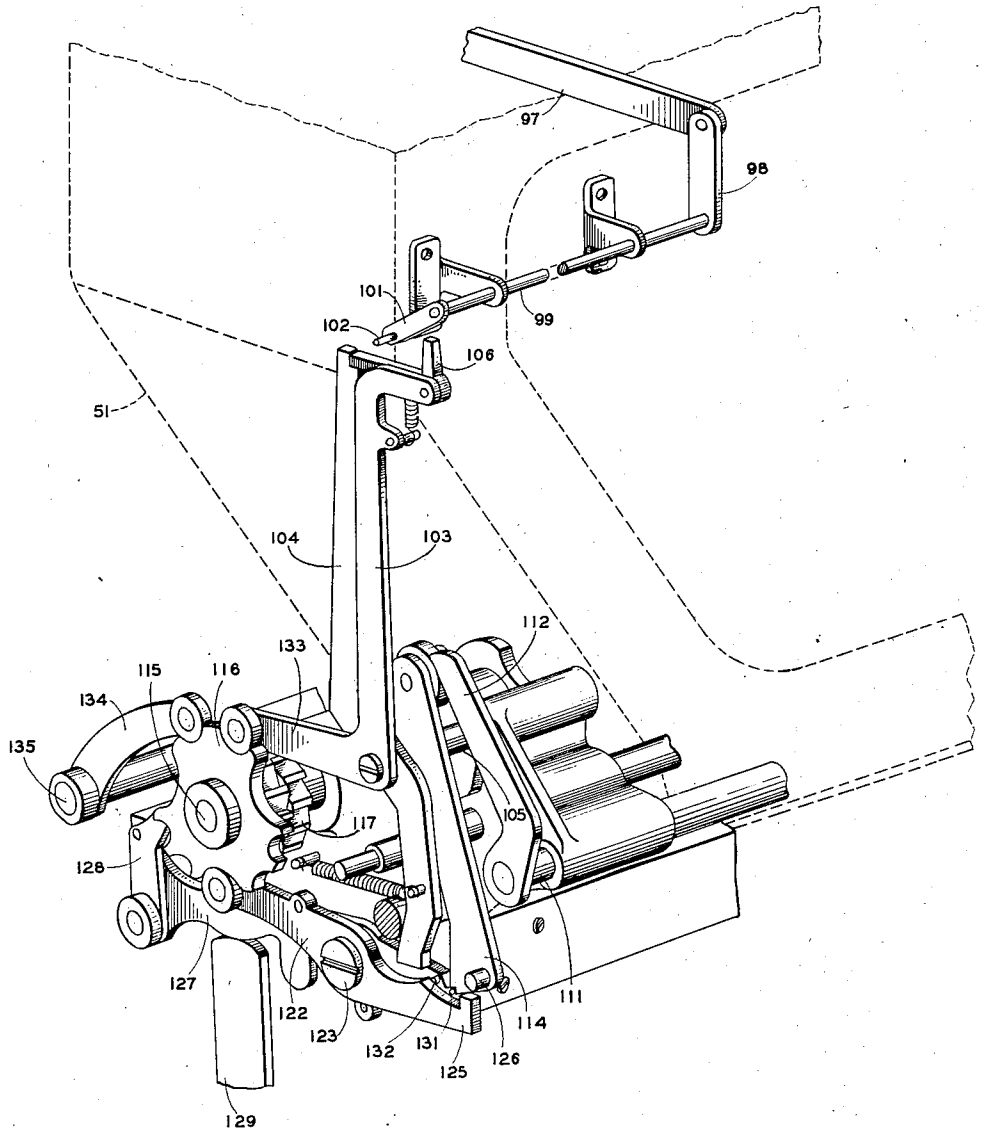


Fig. 15.

WITNESSES

H. D. Hineline

A. H. Woodmansee

INVENTOR
W. W. LASKER

BY H. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 14

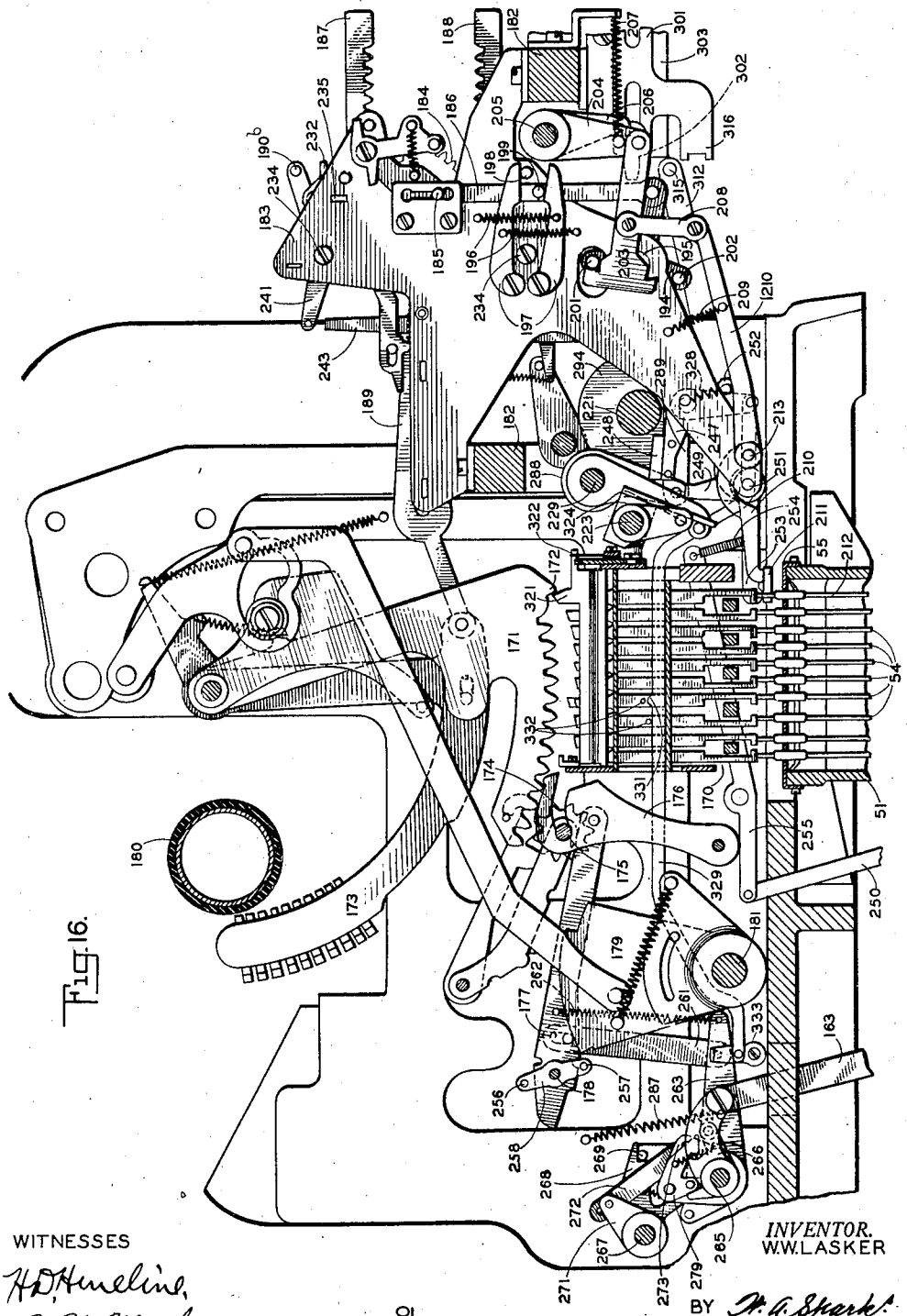


Fig. 16.

WITNESSES

H. D. Hunelind

A. W. Maschmeyer

INVENTOR.
W. W. LASKER

BY W. A. Sparks
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 15

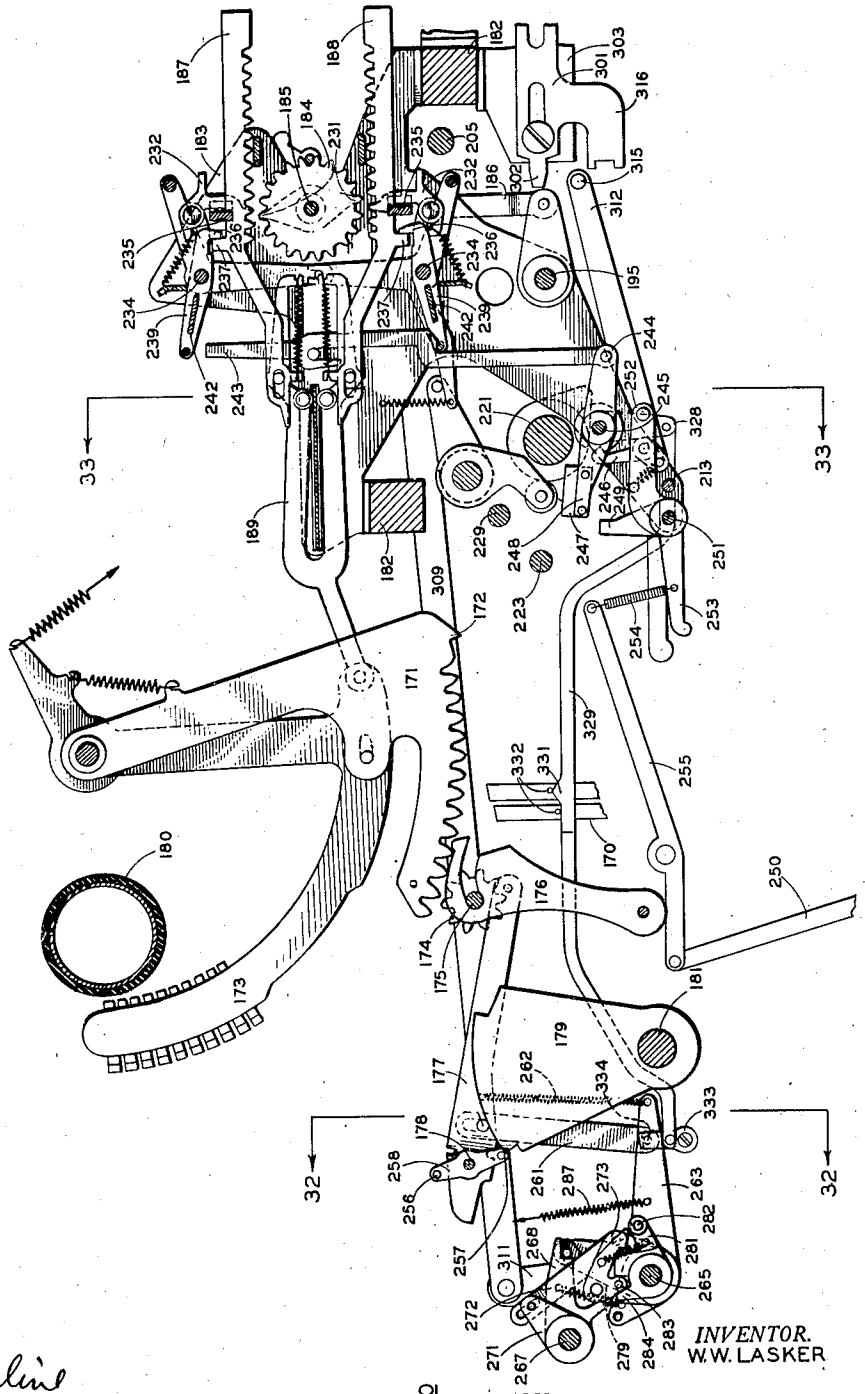


Fig. 17.

WITNESSES

H. D. Hineline

A. H. Maschmeyer

INVENTOR.
W. W. LASKER

BY

F. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 16

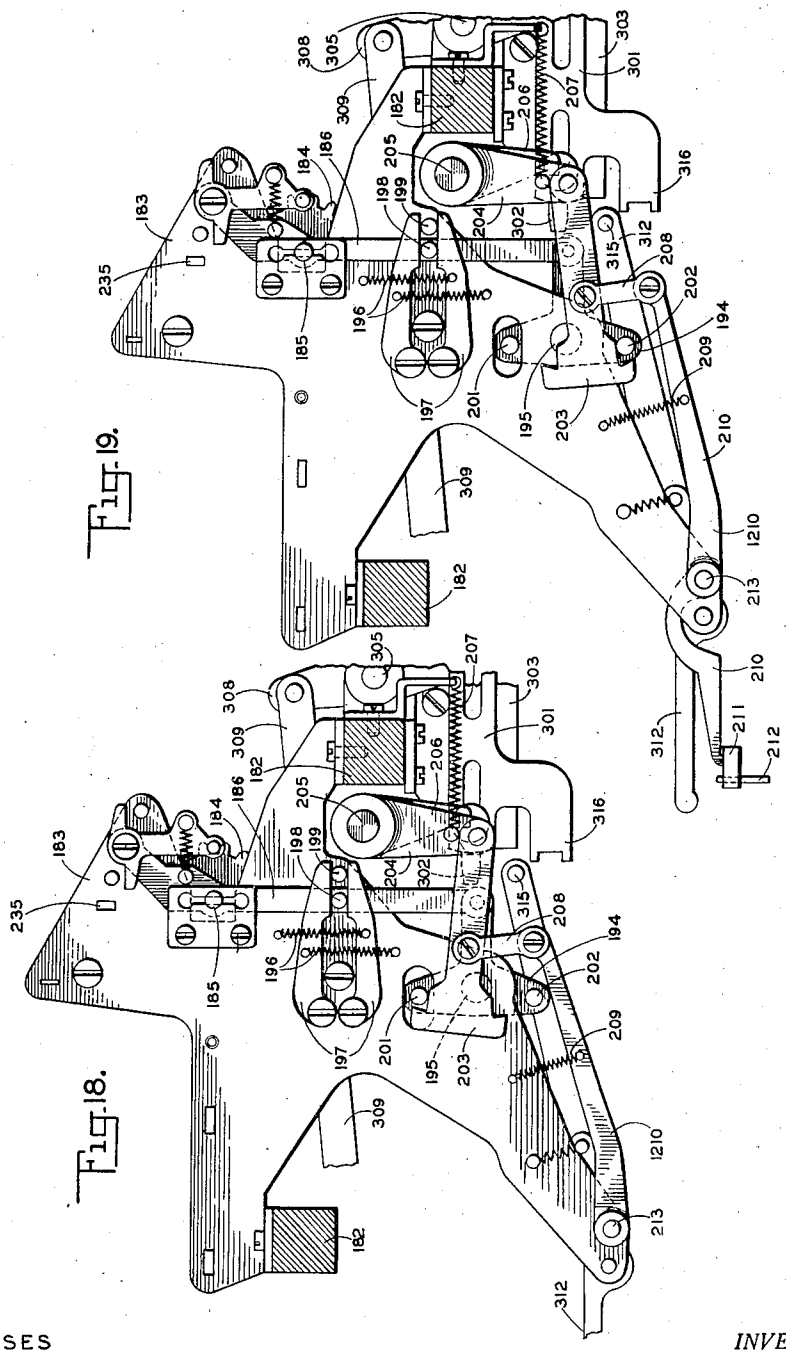


Fig. 19.

Fig. 18.

WITNESSES

H. Hineline

A. H. Maschmeyer

INVENTOR.
W. W. LASKER

BY W. A. Sparks
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 17

Fig. 21.

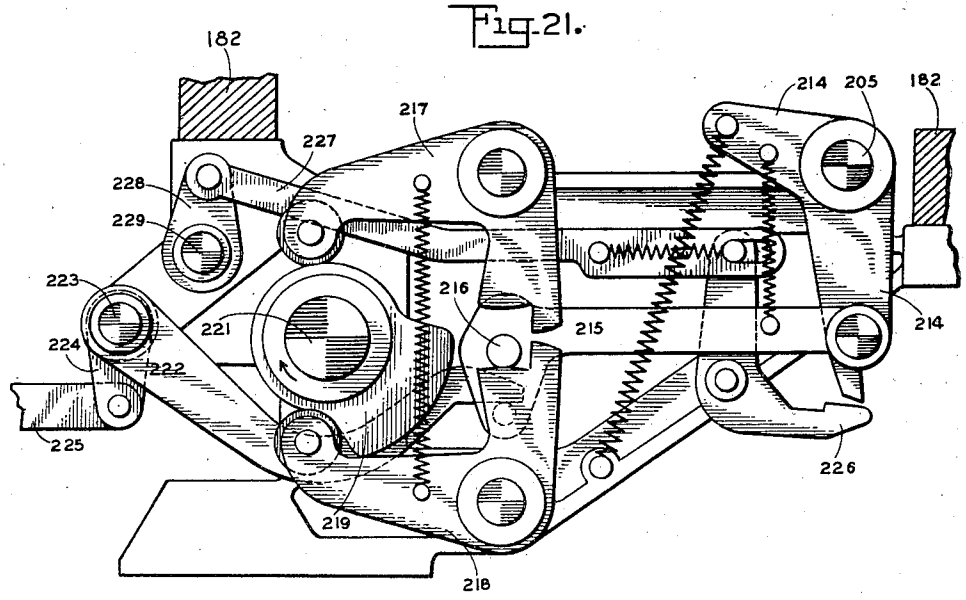
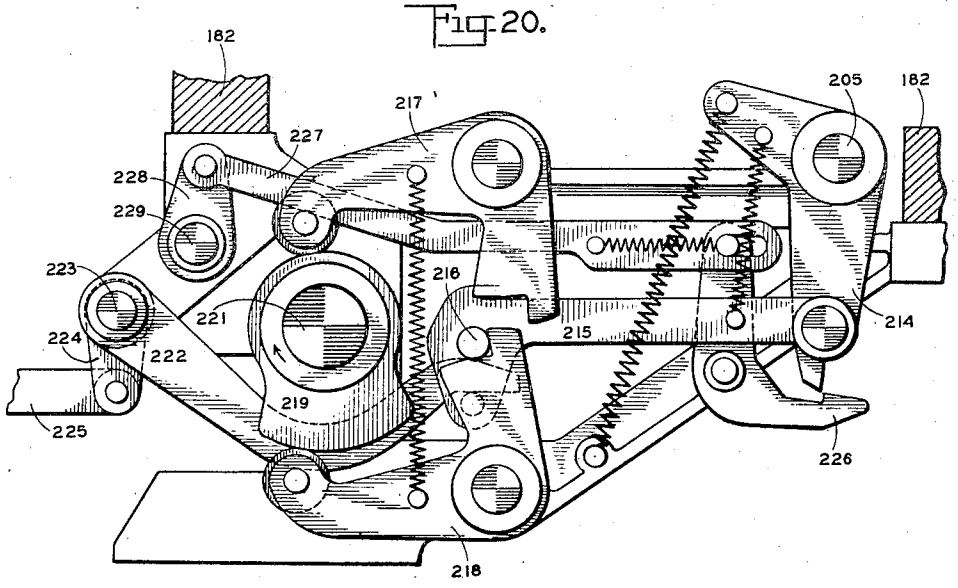


Fig. 20.



WITNESSES

H. D. Hineline

A. H. Mackinnon

INVENTOR.
W. W. LASKER

BY A. C. Sparke

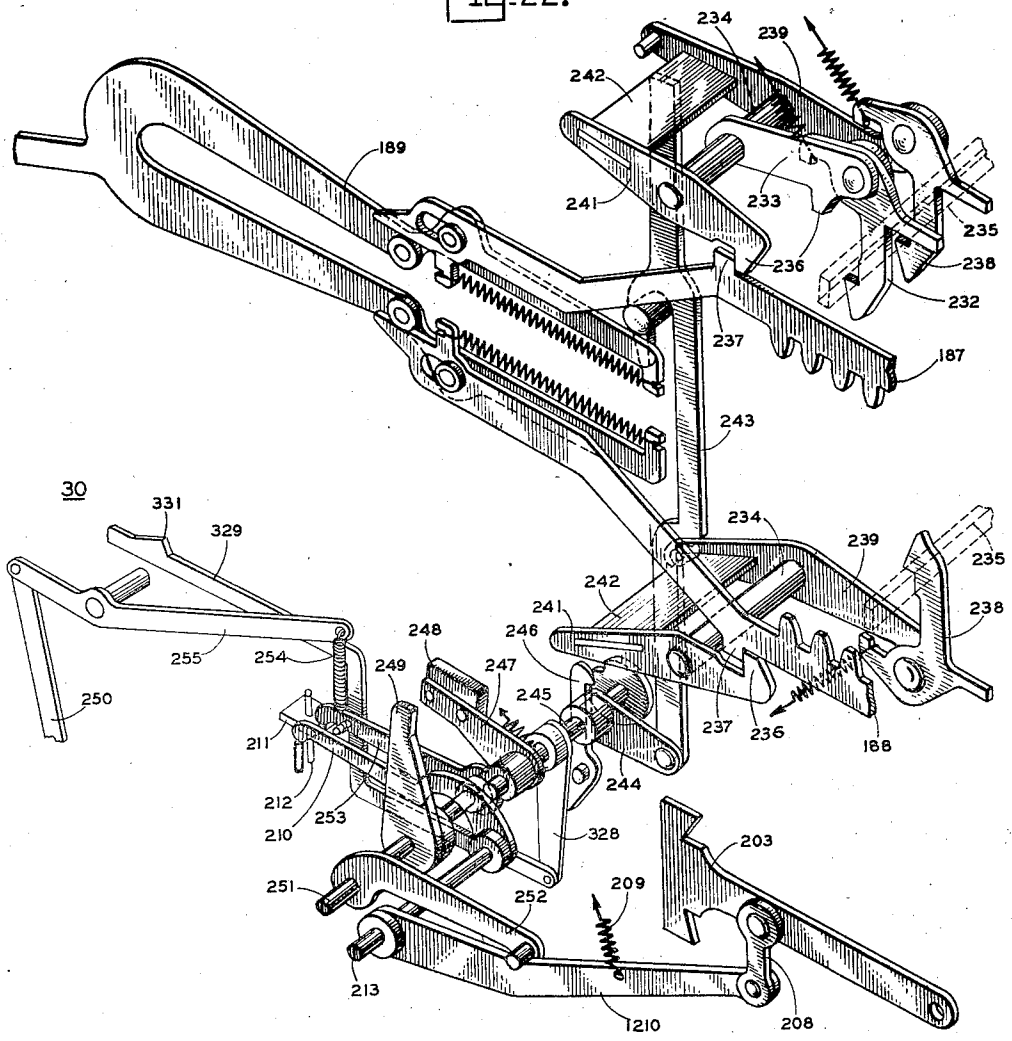
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 18

Fig. 22.



WITNESSES

Hortineline

C. H. Maschmeyer

INVENTOR.
W.W.LASKER

BY W. A. Sparks
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 19

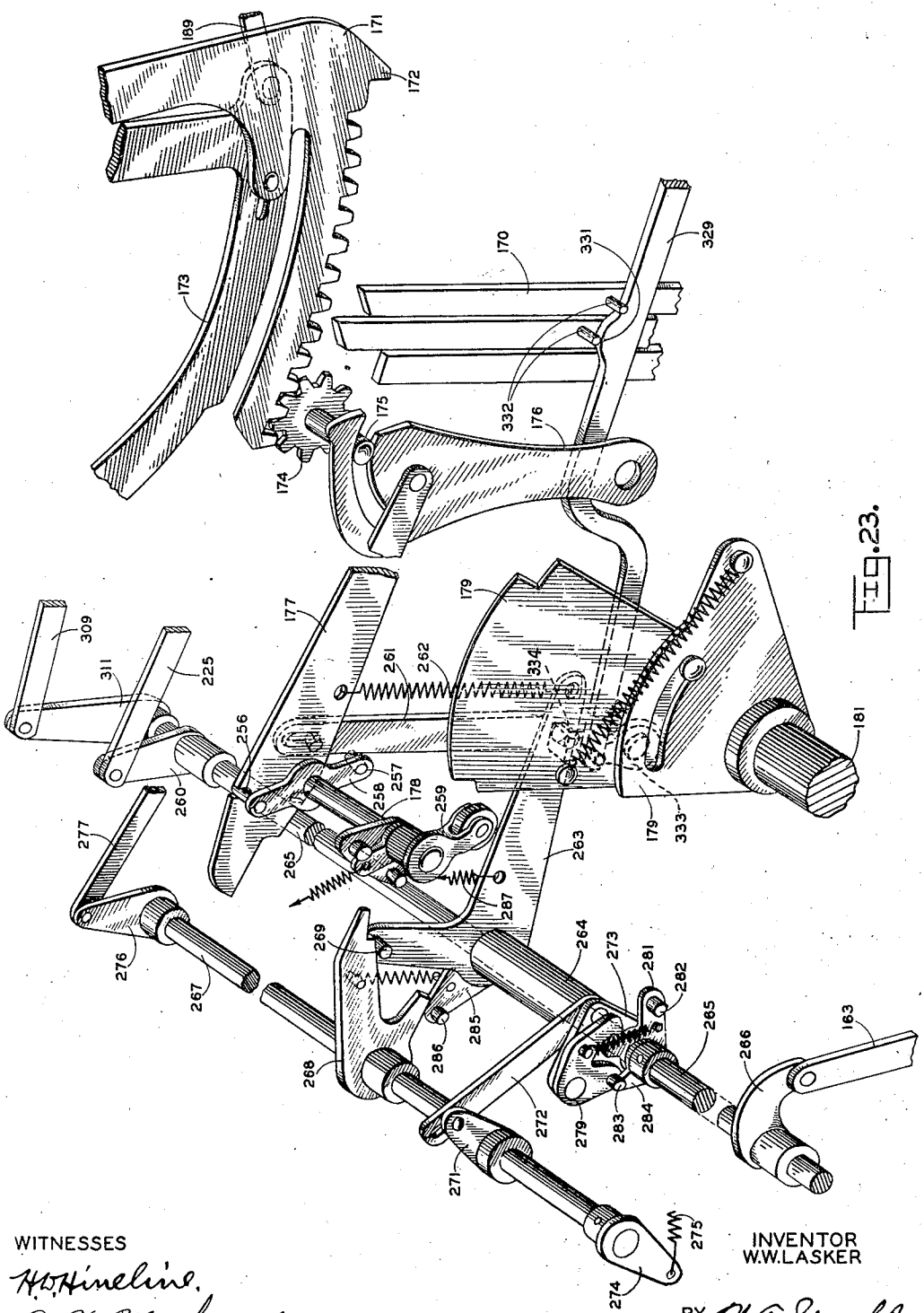


FIG. 23.

WITNESSES

H. D. Hineline.

A. H. Mackmyer

INVENTOR
W. W. LASKER

BY W. A. Sparks
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 20

Fig. 24.

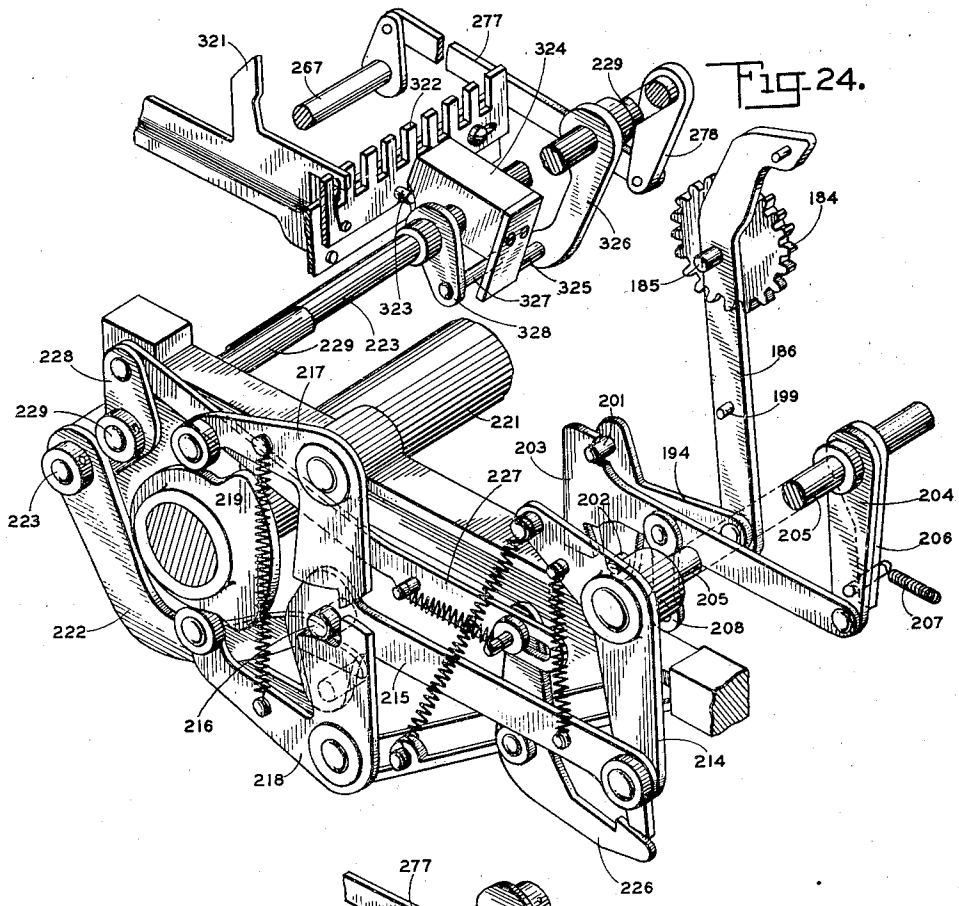
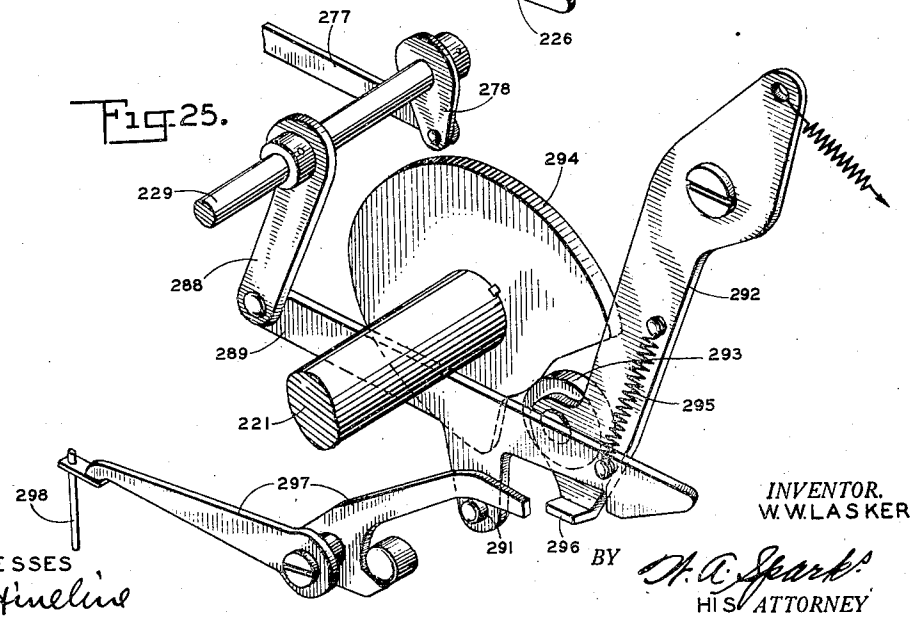


Fig. 25.



INVENTOR.
W. W. LASKER

WITNESSES

BY

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 21

Fig. 26.

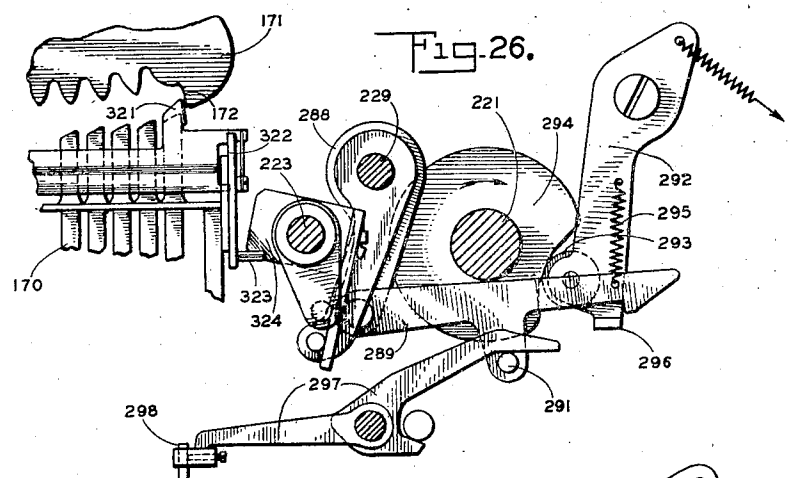


Fig. 27.

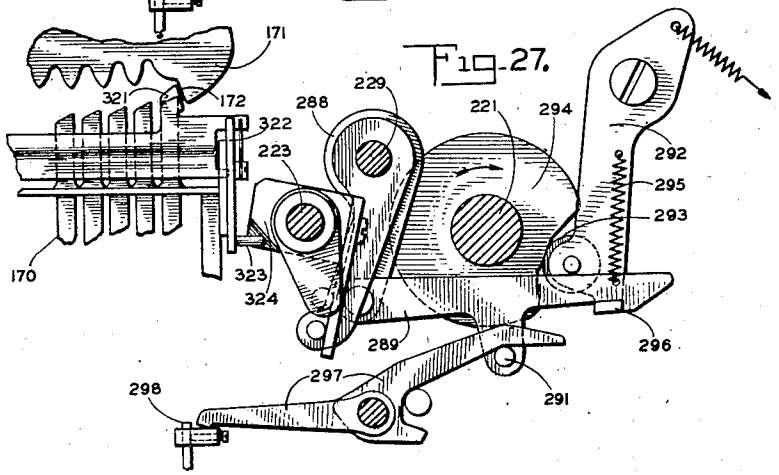
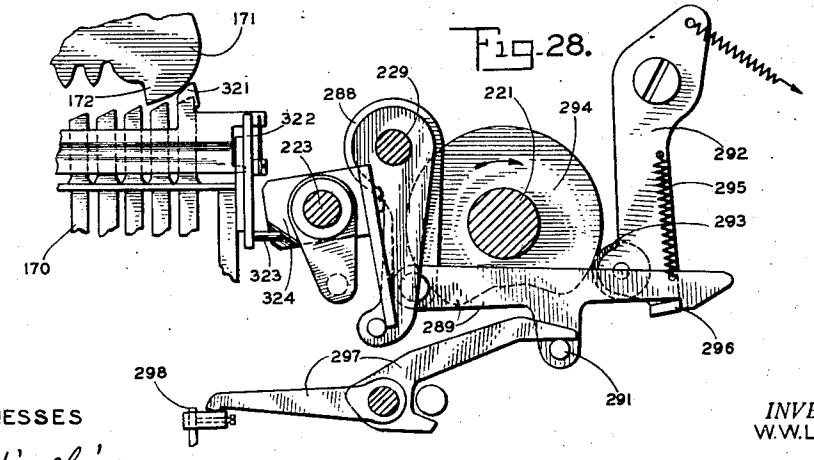


Fig. 28.



WITNESSES

H. D. Hinelline

A. H. Upschmyer

INVENTOR.
W. W. LASKER

BY W. A. Sparks

HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 22

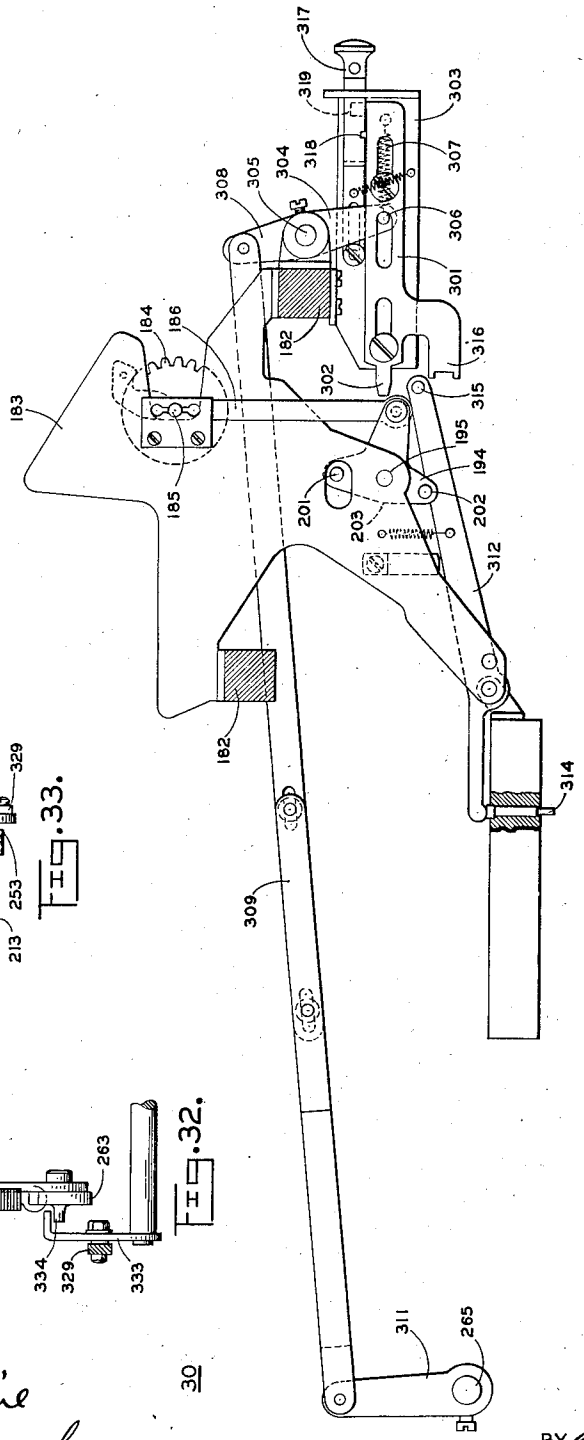


FIG. 29.

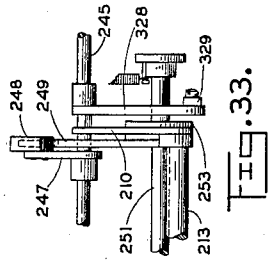


FIG. 33.

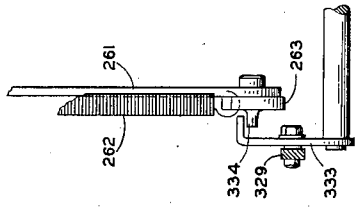


FIG. 32.

WITNESSES

H. D. Hineline

A. H. Maschmeyer

INVENTOR
W. W. LASKER

BY W. A. Sparks
HIS ATTORNEY

Dec. 13, 1938. W. W. LASKER 2,140,136

TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 23

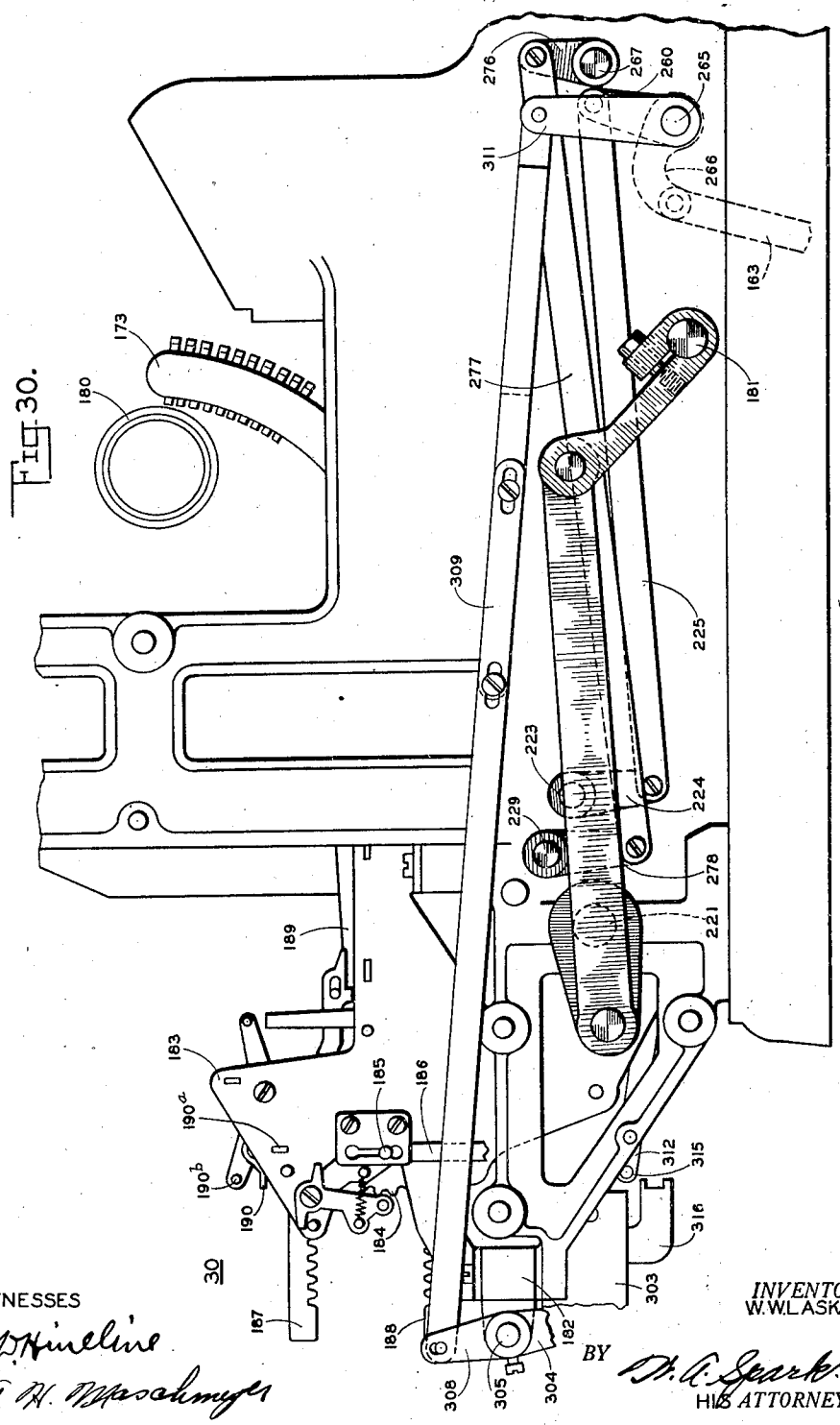


FIG 30.

30

WITNESSES

H. D. Pineline

A. H. Wasserman

INVENTOR
W. W. LASKER

BY D. A. Spark

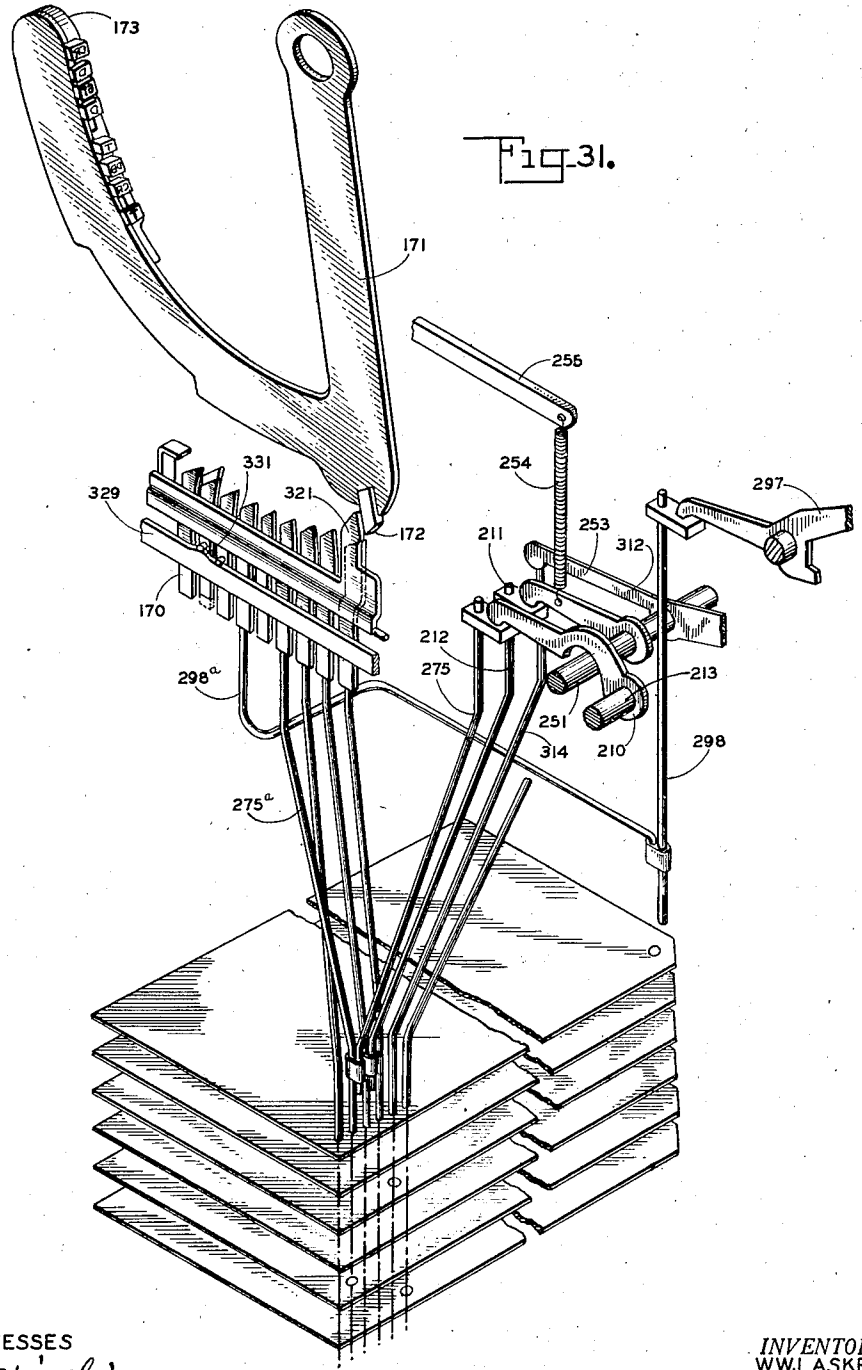
HIS ATTORNEY

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TABULATING MACHINE

Filed April 28, 1936 24 Sheets-Sheet 24

Fig. 31.



WITNESSES

H. W. Hineline

A. R. Mashuniyis

INVENTOR.
W. W. LASKER

BY W. A. Sparks

HIS ATTORNEY

Patented Dec. 13, 1938 2,140,136

UNITED STATES PATENT OFFICE

2,140,136

TABULATING MACHINE

William W. Lasker, Brooklyn, N. Y., assignor to Remington Rand Inc., Buffalo, N. Y., a corporation of Delaware

Application April 28, 1936, Serial No. 76,733

3 Claims. (Cl. 235—61.6)

This invention relates to punched card tabulator systems and methods, and particularly to a tabulator device and method for the construction of bank interest summation tables and running balance summation tables.

In certain business activities, of which the most representative is banking as practiced in Europe, or stock brokerage accounting in the United States, it is customary to pay interest on credits and to charge interest on debits at regular intervals. For this purpose the balances in the customer's account for each day of the desired interest period, are summarized, and the summaries multiplied by the rate of interest paid, or charged, in the form of the amount per dollar per day, to determine the total amount of interest to be paid or charged.

This problem may take any one of three forms. The first form may be regarded as that in which no debits occur, as in the case of a bank account where over-drafts are not allowed. The second form of the problem is that in which the same interest rate is paid on deposits and charged on over-drafts. The third form of the problem is that in which a different interest is charged on over-drafts than is paid on credits.

These problems are of a type that lend themselves to solution by punched card accounting methods, and to this end the tabulator machine may be differently arranged according as the accounting requirements take the form of the several above indicated problems. As is usual with such accounting systems, a punched card is prepared for each transaction. These cards are sorted according to the customer, and into chronological sequence, and then tabulated. For the first problem only two accumulator sections are required for the interest table summation, one to totalize the amounts for each day's transactions, and the other to carry the running balance and to accumulate and totalize the summary. The second problem also requires but two accumulator sections, one for the totaling of each day's accounts, and the other for carrying the running balance and for obtaining the summary. For the second problem it is required, however, that the summation accumulator be capable of subtracting debit amounts from the summary, and for this purpose subtraction by the use of a nines complement is necessary. The third problem requires the use of three accumulator sections. One of these comprises an algebraic accumulator for totaling the daily transactions. The other two, each comprising an algebraic accumulator and a grand total accumulator, having interconnected actuators, for carrying the running balance and for accumulating and totaling the summary, the running balance being carried in the algebraic accumulator, and the grand total accumulator being selectively utilized for the summary accumulation in accordance with the characteristic of the running balance. The present embodiment shows a tubulator arranged for use with the third problem.

Previous attempts have been made to utilize tabulators for this purpose, as shown by French Patent No. 699,960, published February 23, 1931 and British Patent No. 347,119 "complete accepted" April 14, 1931. Originally such accounts were computed by manual bookkeeping methods, which however involved an undesirable amount of bookkeeping which is both laborious and expensive.

The present invention provides a bank interest computing tabulator in which "direct subtraction", or "algebraic", accumulator members are provided to avoid the necessity of double punching of the amounts, and of the use of nines complements on the transaction cards, as required in previously known systems. The invention further provides a calendar comparison mechanism for determining the number of days intervening between successive transaction cards, and for controlling the number of repeated transfers of the running balance to insure a proper summation of all of the day balances for all of the days in the interest period. The invention further provides, in the calendar comparison mechanism, members for determining the number of days between successive transactions in terms of the full number of days in the interest period, both units and tens, and desired, in terms of months or even years as well.

The system thus consists broadly of the combination of a punch mechanism adapted to punch the record cards in the usual manner, the numerical items, whether positive or negative, being recorded once in normal digits, as distinguished from a nines complement record for negative items, and for the insertion of a special perforation to indicate the occurrence of a negative or debit amount. The system further includes also a sorter for the purpose of segregating the record cards for the various customers, and of arranging them in chronological sequence, and further an especially prepared tabulator. The tabulator includes the usual card sensing mechanism, and automatic mechanism operative on a change-of-designation in the punching for taking a total, as shown in Patent

No. 2,044,119, dated June 16, 1936. The tabulator further includes a special sensing mechanism for comparing the date record on a card with a sequential day record in the tabulator, and mechanism to cause the repeated transfer of the running balance to the summation totalizer until the card record and the day record coincide, as shown in my copending application S. N. 684,438, filed August 9, 1933. The tabulator further contains an algebraic accumulator, or direct subtraction accumulator, as shown in the copending application S. N. 535,842, filed May 8, 1931, now Patent No. 2,124,177, issued July 19, 1938, coupled to an ordinary accumulator, in addition to which there are means for carrying a running balance in the algebraic accumulator, and for the transfer of consecutive totals, or successive day balances, from the algebraic accumulator to the main accumulator, as well as various control members which will be later described.

Thus, the invention lies, in part, in a new form of mechanism for comparing card date records with a sequential day record and also in the combination of this new comparison mechanism with an algebraic totalizer, as well as with means for the carrying of a running balance in an algebraic totalizer, for the clearing of the algebraic accumulator at the proper time; for the clearing of the summation accumulator at the proper time, and with mechanism for printing other data records, and with control mechanism of various types.

This application is a continuation in part of copending application S. N. 684,438, filed August 9, 1933. The invention discussed herein is applied to, and combined with, various elements of the structures shown in patents numbered 1,236,481, 1, 245,502, 1,245,503, 1,245,504, 1,245,505, 1,245,506 (Reissue No. 18,727), 1,253,696, (designation printing), 1,476,555 (automatic total latch), 1,388,271 (automatic designation printing), 1,705,983, 1,768,526 (alphabetic sector), 1,780,621 (90-column code).

Thus, an object of this invention is to construct an interest summation table.

Another object of the invention is to carry a debit or credit running balance in a single tabulator accumulator section.

Still another object is to carry a running balance of debit and credit items in a single tabulator accumulator section.

Still a further object is to carry a running balance of debit and credit items in a single tabulator accumulator section without the use of nines complement punching on the record card.

Still another object of the invention is to compare date records on tabulator cards with a calendar device.

Still another object of the invention is to carry a debit and credit running balance in a tabulator accumulator and transfer the amount of that balance to another accumulator once for each day in a calendar period.

An additional object of the invention is to summarize a series of business transactions scattered over a calendar period, and to transfer to another accumulator a day's balance for each day of the calendar period according to the amount of the balance for that day without regard to the presence or absence of a transaction on any given day.

A still further object of the invention is to record a variety of business transactions on cards, to sort the cards according to customers, to sort each customer's cards into chronological sequence, to enter a given customer's debit and credit amounts in the form of a running balance in a tabulator and to summarize the amount of the successive balances for each day of a calendar period, for the production of an interest summation for that customer.

Another object is to compare data cards with a permanent calendar record in a tabulator machine.

Still another object is to carry a running balance in a direct subtraction accumulator.

Still another object of the invention is to transfer amounts from an algebraic totalizer to an ordinary accumulator consecutively.

Still a further object is to transfer a series of amounts from an algebraic totalizer to an ordinary accumulator without clearing the totalizer between transfers, but clearing only at the end of a series of transfers.

An additional object is to carry a plurality of identical running balances and transfer from one or another according as the balance is debit or credit.

Still a further object of the invention is to accumulate a summation of the balances standing at the close of business at each successive day over a predetermined calendar period.

Other objects and structural details of the invention will be apparent from the following description when read in connection with the accompanying drawings, wherein:

Fig. 1 is a view, in isometric projection, of the tabulator machine member of the system of this invention.

Fig. 2 is a side view, partly in section, of the tabulator member of the system of this invention.

Fig. 3 is a side view, partly in section of the accumulator member, connection basket, calendar comparison mechanism and total taking control mechanism.

Fig. 4 is a side view, partly in section of the designation sensing mechanism for total-taking control.

Fig. 5 is a top view of the mechanism for control of total-taking.

Fig. 6 is a view in isometric projection of the designation sensing mechanism.

Fig. 7 is a view in exploded isometric projection of the total control mechanism.

Fig. 8 is a side view, partly in section, of the calendar comparison mechanism of this invention.

Fig. 9 is a rear view of a translator connection basket with the calendar comparison mechanism in place.

Fig. 10 is a top view, partly in section, of the calendar comparison mechanism.

Fig. 11 is a front view, in vertical section, of the calendar comparison mechanism.

Fig. 12 is a side view of the total control mechanism and calendar comparison mechanism.

Fig. 13 is a view, in isometric projection, of the operating mechanism of the calendar comparison device.

Fig. 14 is a developed view of the calendar record drum of the calendar comparison mechanism.

Fig. 15 is a view, in isometric projection, of the total control mechanism and the connection to the calendar control mechanism.

Fig. 16 is a side view, partly in section, of the accumulator mechanism, including an ordinary accumulator set and an algebraic accumulator set.

Fig. 17 is a skeleton side view of the operating members of the accumulator mechanism.

Fig. 18 is a side view of the algebraic accumulator, showing the mechanism for distinguishing between addition and subtraction in preparatory position for addition.

Fig. 19 is a similar side view in preparatory position for subtraction.

Fig. 20 is a side view of the algebraic totalizer timing mechanism in position for beginning the accumulation cycle.

Fig. 21 is a side view of the mechanism of Fig. 20 showing the parts in operated position after the start of an accumulating cycle.

Fig. 22 is a skeleton view, in isometric projection, of the mechanism for inserting the fugitive one and for control of debit and credit totaling.

Fig. 23 is a skeleton view, in isometric projection, of the timing control mechanism for the summation accumulator.

Fig. 24 is a skeleton view in isometric projection, of the algebraic accumulator timing mechanism and totaling mechanism.

Fig. 25 is a skeleton view, in isometric projection, of the summation total control mechanism.

Fig. 26 is a side view, partly in section, of the summation total control mechanism in accumulating position.

Fig. 27 is a similar side view in initial totaling position.

Fig. 28 is a similar view in totaling position.

Fig. 29 is a side view of the mechanism for carrying a running total in the algebraic accumulator.

Fig. 30 is a side view of the tabulator mechanism showing the control linkages between front and rear total shafts.

Fig. 31 is a skeleton view, in isometric projection, of the special character printing mechanism and total control.

Fig. 32 is a side view of the summation control-latch mechanism, and

Fig. 33 is a side view of the actuating levers for the summation control-latch mechanism.

The system

As above suggested, the invention is to be found partly in the details of the mechanism herein disclosed, partly in a new combination of old elements, and partly in the system.

The first element of the system is the set of data cards. These cards are prepared in the well known manner to record by perforations on each card the various details of a business transaction, such as the identifying data, which may be a customer's number or may be the customer's name, the latter being preferable in the present system, the date of the transaction; the character, such as debit or credit transaction; the value data and other pertinent information. With these items, the card also carries a record of the money involved in the transaction. However, this record of the money amount of the transaction is made but once, and in normal figures, as distinguished from nines complement figures, the item, when a debit, being so indicated by a special perforation. The card may carry, in addition, any other information which is desirable, such as a record of the interest rate, etc. These cards are conveniently prepared by any suitable type of card punching mechanism and in any desired code, such as the well known single unit code used with the so-called 45-column card, or the two unit code used with the 90-column card, and include any needed special perforations, such as those for indicating debit amounts, for control of naught blocks, etc.

The cards are conveniently prepared from day to day as the transactions occur, and may be filed in any convenient manner. At the end of the interest period, all of the cards are removed from the file and put through the sorter to segregate, first, all of the cards for each customer, and then to assort the cards for each customer in chronological order.

Usually it is considered that a balance exists in each account at the close of any interest period, even though the amount represents an overdraft, and, accordingly, the balance at the end of the first day in the new interest period is the amount resulting from that day's transactions plus the balance remaining from the previous day, which obviously is the balance left in the account at the close of the preceding interest period. Accordingly, a balance card is also prepared for each customer, recording for that customer, the amount of the balance in the account at the beginning of the interest period. This card may or may not carry a date, as desired, but, since it is a part of the amount for the first day, it may conveniently carry the date of the first day of the new interest period. Since, however, it is not a part of the transactions for that day, the amount should not be accumulated in the day transaction accumulator, and, accordingly, the day transaction accumulator is provided with a suitable device for performing this function as will be hereinafter considered.

At the close of each customer's group of cards, a set of special control cards is provided. These consist of a last day card which need carry no other punching than the date of the last day of the month, this card being required to insure the completion of all of the necessary transfers of the running balance regardless of the presence or absence of a transaction card on the last day of the month. This card is followed by a clearing card which carries a date one day later than the last day card, and contains a perforation for actuating the mechanism to clear the running balance accumulator as an incident of the last transfer of the running balance to the summation accumulator. The clearing card is followed by a space card which need carry nothing but a date one day later than the clearing card, two days later than the last day card. This card causes another transfer from the running total accumulator, but, since this has been cleared, only zeros are transferred, for the purpose of completing any tens carry which may have been initiated in the summation accumulator. This space card is then followed by a summation total card which has an appropriate perforation for the total pin, and may carry the same date as the space card, and serves for the taking of the summation total and the clearing of the summation accumulator.

The successive groups of cards are then brought to the tabulator and fed through the sensing chamber. Because of the fact that the balance card of the first day group or a subgroup has a different designation than the previous summation total card, the machine senses the change-of-designation and goes through a totaling cycle. Thereafter, the balance card is sensed, and the amount indicated thereon is accumulated in the algebraic accumulators for the summation, but not into the day transaction accumulator. The balance card carries the date of the first day of the interest period, usually the first day of the month, and is followed by the item card for the

first transaction. This first item card may carry the same date as the balance card, or may carry a later date according to the presence or absence of a transaction on the first day of the interest period. If the dates are the same, the amount indicated on the item card is accumulated into the algebraic accumulators in normal fashion, and any other cards bearing the same date are similarly accumulated. When all of the amounts indicated on the transaction records for the first day have been accumulated, a card for a later day appears. The effect of a later date in the item cards is the same on the machine whether it occurs immediately after the balance card or after the balance card and a group of transaction cards for the first day.

The different date on a later dated card is recognized by the designation mechanism in the tabulator and the totaling mechanism is actuated. This suspends the feeding of cards, holds the card gate closed, and releases the sensing pins, permitting the machine to make the necessary blank stroke to complete tens carries, and then pulls the total link. The pulling of the total link causes the machine to go into total taking timing and transfer the amount standing upon the algebraic accumulator to the main or summation accumulator, but without clearing the algebraic accumulator. At the same time, the calendar sensing mechanism compares the reading of the date on this differently dated card with the calendar setting of the machine calendar, finds it different, and moves the calendar record along to the next day. If the date of the new card is that of the second or next day, the total taking mechanism is restored to normal position, returning the tabulator to accumulating timing, and the accumulation of the items recorded upon the cards of the second day is conducted. If there is a transaction card for every day in the month or interest period this sequence of operations is continued to the end of the month or period, the data from each card being accumulated in the algebraic accumulators whether debit or credit.

However, it rarely happens that there is a card for every day in an interest period, in view of the fact that business is not commonly done on Sundays and holidays, as well as the fact that not every customer will always have a business item on every business day. Accordingly, after the cards for one day have been accumulated and cards for another day appear, one or more days may intervene between the transactions, which may be the number of days up to the full number of days in the interest period. The change-of-designation mechanism senses the change in dates without regard to the numerical interval therebetween. However, the calendar comparison mechanism compares the date upon the new data card with the calendar device and controls the totaling mechanism according to the results of the comparison. As before pointed out, if the new data card is in chronological sequence with the previous card only a single total is transferred from the algebraic accumulator to the main accumulator. However, if the new data card carries a date several days later than the next preceding one, the calendar comparison mechanism holds the machine in totaling timing, and a total is transferred from the balance in the algebraic accumulator and accumulated in the main accumulator as many times as there are intervening days. When the calendar comparison mechanism has caused the transfer of the required number of totals, and has reached, in its movement, the day setting corresponding to the date on the card in the sensing chamber, the totaling mechanism is released, the machine restored to accumulating timing, and the items of the next card, or cards, are accumulated as before. This procedure is continued, without clearing the algebraic accumulators until the end of the month, or period, is reached. When the change-of-designation mechanism senses the day beyond the end of the interest period, the last transfer from the algebraic accumulator to the main accumulator is accompanied by a clearing of the algebraic accumulator preparatory for operation upon the next customer's cards, this being obtained by the above described special cards, one punched for the last date in the month only, and the other with the next higher number and the special perforation for control of the algebraic accumulator clearing mechanism to permit clearing on the total transfer for the last day.

The interest summation total is then obtained by means of space and total cards following the pair of special cards as above described. The third special card, the space card, provides another total transfer stroke, which, however, transfers only zeros since the algebraic accumulator was cleared after the previous card. This, however, provides the necessary spacing stroke for completing tens carries in the summation accumulator. The space card is followed by the total card, which may have the same date punching and the punching for the grand total control pin.

During the total operation the interest summation total is printed, and the summation total accumulators are cleared. Thus, for a twenty-eight day month, the first of the special cards at the end of the stack of data cards will carry the number twenty-eight in the designation field and will cause the transfer of a sufficient number of totals, whether there is or is not a transaction card for the last day of the month. The second special card will carry the number twenty-nine in the designation field and the clearing control perforation and the other cards may carry the next higher number in the designation field. For a thirty-one day month, the first of the special cards will be punched with the number thirty-one, the second card will be punched with the number thirty-two, and the third with the number thirty-three. The mechanical calendar in the machine, thus, may have thirty-three numbers. It will thus be evident that for months having less than thirty-one days, the summation total stroke will be followed by a number of extra balance transfer strokes to bring the total number of strokes to thirty-three, in order to follow the calendar reading to its end preparatory to resuming accumulating on another customer's data cards. Since, however, both accumulators have previously been cleared, these extra strokes which transfer zeros only are of no moment. Alternately, of course, special calendar drums may be provided having number records adapted for use with the number of days in the month for which the cards are to be tabulated.

Alternatively, the special cards (but not the balance card) may be dispensed with by providing as a part of the calendar mechanism suitable members for operating the clearing member and the summation total pin from settable members on the calendar drum.

The summation record

It is, of course, desirable that a printed record of the account should be available, and the tabulator of this system is particularly adapted to produce such a printed record, which is available for use as a ledger page, or for any other desired uses. The machine hereinafter described is particularly adapted to produce a record sheet including all of the transactions in a given account, together with a record of the procedures leading to the summation amount.

The ledger page may conveniently take the form shown in the following table in which the items printed in the columns entitled "Transaction and day total", "Running balance and credit summation", and "Debit running balance and debit summation", indicate the significant amounts printed on the record. The items shown in the columns entitled "Amount in credit summation accumulator" and "Amount in debit summation accumulator" are not printed, but have been added to the present table for the sake of clarity, to show the amounts standing on the summation accumulators after each total transferring operation:

	Date	Debit or credit	Transaction and day totals	Running balance and credit summation	Debit running balance and debit summation	(Amount in credit summation accumulator not printed)	(Amount in debit summation accumulator not printed)
Balance card	4-1	C		391.00	391.00	(000.00)	(000.00)
Transaction	4-1	C	67.21	67.21	67.21		
Do	4-1	D	26.09	26.09	26.09		
Total	4-1		41.12C	432.12CB	432.12CB	(432.12)	(000.00)
Transaction	4-2	C	43.17	43.17	43.17		
Do	4-2	C	133.91	133.91	133.91		
Do	4-2	D	189.43	189.43	189.43		
Do	4-2	C	16.27	16.27	16.27		
Total	4-2		003.92C	436.04CB	436.04CB	(868.16)	(000.00)
Total				436.04C	436.04C	(1304.20)	(000.00)
Transaction	4-4	D	247.61	247.61	247.61		
Do	4-4	C	33.90	33.90	33.90		
Do	4-4	D	295.47	295.47	295.47		
Total	4-4		509.18D	73.14DB	73.14DB	(1304.20)	(73.14)
Transaction	4-5	C	367.27	367.27	367.27CB		
Total	4-5		367.27C	294.13CB	294.13CB	(1598.33)	(73.14)
Total				294.13CB	294.13CB	(1892.46)	(73.14)
Total				294.13CB	294.13CB	(2186.59)	(73.14)
Transaction	4-8	D	143.16	143.16	143.16		
Do	4-8	D	91.27	91.27	91.27		
Total	4-8		234.43D	59.70CB	59.70CB	(2246.29)	(73.14)
Total				59.70CB	59.70CB	(2305.99)	(73.14)
Total				59.70CB	59.70CB	(2365.69)	(73.14)
Transaction	4-11	D	137.96	137.96	137.96		
Do	4-11	D	368.42	368.42	368.42		
Total	4-11		506.38D	446.68DB	446.68DB	(2365.69)	(519.82)
Total				446.68DB	446.68DB	(2365.69)	(966.50)
Total				446.68DB	446.68DB	(2365.69)	(1413.18)
Total				446.68DB	446.68DB	(2365.69)	(1859.86)
Total				446.68DB	446.68DB	(2365.69)	(2306.54)
Transaction	4-16	C	377.29	377.29	377.29		
Total	4-16		377.29C	69.39DB	69.39DB	(2365.69)	(2375.93)
Total				69.39DB	69.39DB	(2365.69)	(2445.32)
Transaction	4-18	C	90.53	90.53	90.53		
Total	4-18	—	90.53	21.14CB	21.14CB	(2386.83)	(2445.32)
Total				21.14CB	21.14CB	(2407.97)	(2445.32)
Total				21.14CB	21.14CB	(2429.11)	(2445.32)
Total				21.14CB	21.14CB	(2450.25)	(2445.32)
Total				21.14CB	21.14CB	(2471.39)	(2445.32)
Transaction	4-23	C	327.16	327.16	327.16		
Do	4-23	C	11.96	11.96	11.96		
Do	4-23	C	243.18	243.18	243.18		
Total	4-23		582.30	603.44CB	603.44CB	(3074.83)	(2445.32)
Total				603.44CB	603.44CB	(3678.27)	(2445.32)
Transaction	4-25	C	81.00	81.00	81.00		
Total	4-25		81.00	684.44CB	684.44CB	(4362.71)	(2445.32)
Total				684.44CB	684.44CB	(5047.15)	(2445.32)
Total				684.44CB	684.44CB	(5731.59)	(2445.32)
Total				684.44CB	684.44CB	(6416.03)	(2445.32)
Transaction	4-29	D	626.88	626.88CB	626.88		
Total	4-29		626.88	57.56CB	57.56CB	(6473.59)	(2445.32)
Last day card	4-30		(000.00)				
Clearing							
Total	4-30		(000.00)	57.56CB	57.56CB	(6531.15)	(2445.32)
Space	4-31		(000.00)	(00.00)	(00.00)	(6531.15)	(2445.32)
Summation							
Total				6531.15T	2445.32T		
Multiplier				X0.0000548	X0.0001643		
Amount				$0.36 (Payment)	$0.40 (Charge)		

The two amounts printed as the summation totals then are the accumulated day balances for days on which the balance was credit and for days on which it was debit. If, for instance, the bank charged 6% interest on debit balances, and paid 2% on credit balances, per year, these respective summations will be multiplied by the respective values for the interest per dollar per day. Thus, the debit balance summation, in the table above reproduced as 2445.32, may be multiplied by 0.0001643, the interest rate per dollar per day at .6% per year to give the charge for the debit balances, and the credit summation of 6531.15 may be multiplied by 0.0000548, the interest rate per dollar per day at 2% per year to give the payment for the credit balances.

The tabulator

The tabulator consists broadly of three portions, the base mechanism **10**, the connection basket **20** and the tabulator head **30**. The base mechanism and total taking mechanism are shown in extensive detail in the above mentioned Patent No. 2,044,119; the connection basket is shown in further detail in application S. N. 684,438 and the tabulator head is shown in extensive detail in the application S. N. 535,842, previously mentioned.

The tabulator base

The base section of the tabulator (Fig. 1), as is particularly well known in Figs. 2 and 4, consists of a sensing pin basket **31** containing sensing pin members **32**, which may be locked by slide members **33**. The basket member **31** is reciprocated by an eccentric member **34** on the main shaft **35** to pass the pins **32** through a sensing chamber **36**. A card magazine **37**, having a picker knife **38**, is provided, together with a lever mechanism **39** for operating the picker knife, and also card feeding rolls **41** for delivering the successive cards to the sensing chamber **36**. Delivery conveyor rolls **42** are provided for delivering the sensed cards to the storage stack **43**.

Above the sensing chamber **36** there is positioned a stationary basket **44** (Figs. 2, 4 and 6) containing interponent members **45** having locking pins **46** adapted to cooperate with locking slides **47** as is particularly well shown in Fig. 4.

Above the locking slide **47** there are provided designation-sensing slides **48**. Above the frame of the pin basket **44** are also provided rail members **49** for supporting the connection basket **20**.

The change-of-designation mechanism, to be later described is likewise mounted upon the frame **44** of the stationary basket.

The connection basket

The connection basket **20** consists of a frame **51** having fins **52** (Fig. 9) adapted to be carried in the rails **49**, and transfer or connection wires **54** leading from the lower plate **53** in operative relationship with the interponent wire members **45** to an upper plate **55** for cooperative relationship with the stop mechanism in the tabulator head, as shown in Figs. 2, 3, 8, 9, 12 and 16.

A tabulator card usually has more than seven fields for recording data, whereas the tabulator head usually has but seven accumulator sections. Accordingly, some only of the information recorded on the card is conveyed to the tabulator head, and the connection basket and the transmission wires therein permit of the operation of any of the accumulator sections from any desired card fields.

Conditions under which it was desirable that totals should not be accumulated in the day transaction accumulator have been indicated above. The device consists of naught blocks **60** for the control of zero stops, and the balance card is provided with a naught block actuating perforation, to prevent the accumulation of the previous balance in the day's transaction accumulator. No naught blocks being provided for the summation accumulators, the amount is accumulated in the running balance accumulator to form a part of the balance at the close of the first day's transactions.

An important portion of the present invention is incorporated in the connection basket in the form of a mechanical calendar, and mechanism for comparing date indications, transmitted by the connection wires from the cards with a setting of the mechanical calendar, and for the production of different cycles of operation of the tabulator according to the results of the comparison.

The tabulator head

Above the connection basket, there is positioned the tabulator head **30** which may consist of seven separate accumulating sections for numerical digits only, or may consist of five sections for the accumulation of numerical digits and an alphabetic printing section taking the place of two numeric accumulator sections, as indicated in Fig. 1 (or of other arrangements as desired). Likewise, the accumulator head may be adapted to operate according to a multi-code as indicated by stops **170** in Fig. 2, or according to a single unit code as indicated by stops **170** in Fig. 3, and all of the sections may be of the same type, or both types may be utilized in different sections according to the requirements of the particular accounting problem.

In addition, one or more of the accumulator sections is equipped with an auxiliary algebraic accumulator as shown in application S. N. 535,842, filed by Lasker and Ruiz.

The connection basket in detail

As shown in Figs. 2, 8, 9, 10 and 11, the connection basket member **20** consists of a frame **51** having a bottom plate **53** with side fins **52** adapted to cooperate with the rail members **49** as shown in Figs. 2, 3, 4, 5 and 6. The bottom plate member **53** is perforated with holes through which the connection wires **54** project to cooperate with the interponent members **45** shown in Figs. 2 and 4. At the top of the frame **51** there are likewise provided openings in the upper plate **55** adapted to support and guide the upper ends of the wires **54** in operative relationship with the stop members **170** of the various accumulator sections in the tabulator head. The wires **54** are of the usual form and may lead directly from the members **45**, which cooperate with one field in the card to one section of the tabulator, or they may be multipled or Y-ed as shown in Fig. 9 so as to operate two or more accumulator sections from a single card field.

The calendar comparison mechanism

In addition to the ordinary connector wires **54**, there are also provided special connector wires **56** as shown in Fig. 8 which likewise lead from a given designation field—usually a date field—in the card to the printing section of the tabulator head, usually the designation printing section, as shown in Figs. 2 and 8.

The special wires **56** (Figs. 8, 9 and 10) are provided with slide members **57** carried in sub-

frames 58 within the body of the basket 51. The members 57 are equipped with two sets of actuating pins as shown, the lower set of pins 59 in each column being adapted to cooperate with a cross-slide 61, which, in turn, cooperates with a pin 62 on an auxiliary slide 63, which performs the function of a slide for zero, but, since zeros are often not punched in the cards, this special provision must be made for the indication of zeros. As shown, the zero slide 63 is raised by its spring 64 and depressed against the pressure of that spring by the slide 61 and pin 62, when other digit slides are raised.

The slides 57 are offset as shown in Fig. 10 and carry a second set of pins 65, which cooperate with feeler slides 66, there being a slide 66 for each perforation position, and for zero, in the designation field, usually the date field. The feeler slides 66 have slots, as shown in Fig. 8, by means of which they are carried upon cross rods 67 (Figs. 8 and 12). The slides 66 also have blocking fingers 68 which cooperate with a swinging cross rail or lock bar 69. The rods 67 are attached to auxiliary side frames 72 which slide in the main frames 71, as shown in further detail in Figs. 2, 3, 8, 9, 10, 11, 12, 13 and 15.

Obviously, the number of slides 57, 63 and 66 that are utilized is dependent upon the number of perforation positions in the designation field being sensed. For the problem set forth herein, only two columns of perforation positions, representing the days of the month, are required. These columns are arranged in accordance with the well known Powers ninety-column combinational code system in which each odd digit is represented by a single perforation and each even digit is represented by two perforations. For the sake of clarity, each feeler slide 57 and 63 (Fig. 10) has been designated by a numeral enclosed in a circle to indicate both the perforation position in the card that controls its elevation, and the stop 170 which it, in turn, elevates. As can be seen in Fig. 10, the units position of the date is controlled by five slides 57 and a slide 63, whereas the tens position of the date is controlled by three slides 57 and another slide 63.

Cooperating with the feeler slides 66 is a calendar drum 73 mounted upon a shaft 74 which is supported in the main frame 71 (Figs. 8, 9, 10, 11, 14). A holding pawl 75 is mounted on frame 71 in a position to cooperate with the teeth 76 on a ratchet wheel fixed to drum 73.

Drum 73 comprises a cylindrical element provided with a plurality of slots of a size and shape suitable to accommodate the rearward ends of feeler slides 66. Each horizontal row of slots shown in the development of drum 73 in Fig. 14 lies in the path of movement of a slide 66 and is designated in the same manner as slides 57 and 63 to indicate the corresponding perforation position in the card. The arrangement of slots, also in accordance with the Powers ninety-column system, is such that combinations corresponding to the days of the month are presented to the row of slides 66 in ascending order as the drum is rotated, the values represented by each combination of slots being shown along the lower edge of drum 73.

A secondary frame 79 is also provided slidable upon the rods 67 and the shaft 74, having a control slot 83 (Fig. 8) cooperating with a pin 84 mounted in the end of the cross rail, or lock bar, 69. Another pawl 77 is mounted upon the secondary frame 79. This pawl 77 is also adapted to cooperate with the ratchet teeth 76 and is resiliently urged against the teeth by a spring 78 as particularly shown in Fig. 8. The auxiliary frame 72 also has a control slot 81 cooperating with a pin 82 upon the pawl 77.

The auxiliary frame 72 is moved to the right by a spring member 85 which operates between an anchorage on the frame 51 and a lever 86 mounted upon a shaft 87 and coupled to links 88 which, in turn, are pinned to the auxiliary frame 72. Another lever 89 upon the shaft 87 cooperates with a push rod 91, which, in turn, is operated by a cam 92 on the main shaft 35. Thus, the auxiliary frame 72 is spring-pressed toward the right and power driven toward the left.

The secondary frame 79 is coupled to a secondary lever 93 mounted upon shaft 94 upon which another lever 95 is fixed and adapted to cooperate with a push rod 91' cooperating with a cam 92' also mounted upon the shaft 35, and spring pressed to the left by the spring 90.

The lock rail 69 is carried upon a pair of arms 96, also pivoted between the auxiliary frames 72 and oscillating with them. At the top of a projection of the auxiliary frame 72 there is pinned a link 97 as is particularly well shown in Figs. 2, 3, 8, 12 and 15.

The link 97 is adapted to operate a lever and shaft assembly as shown particularly in Fig. 12 and also in Figs. 2, 3 and 15. This assembly consists of an upstanding lever 98, a shaft 99 and a depending lever 101 on which is a trip pin 102 adapted to cooperate with levers controlling the totaling mechanism, all mounted upon the connection basket 20. These control levers consist of a main bell crank shaped lever 103, and a secondary lever 104, both journaled upon a bearing shaft 105. The lower ends of these levers cooperate with the change-of-designation mechanism, as later described. The upper end of the lever 103 carries a bell crank lever 106, the vertical arm of which is adapted to cooperate with the pin 102 and the horizontal arm of which is adapted to cooperate with the upper end of the lever 104.

Change-of-designation mechanism

Above the tabulator base 10, mounted thereon and adjacent the connection basket 20, there is provided a change-of-designation mechanism as particularly shown in Figs. 1 to 7 inclusive, 12 and 15. This mechanism consists of sensing slides 48 (Fig. 4) which are operated by movement of the pins 50 mounted on the interponents 45, against the cam edges of the openings in the slides 48. The slides 48 are adapted to cooperate with members 107 which can be raised or lowered by manually settable levers 110 which may take various forms as shown in Figs. 1 and 7, or Fig. 6. When the members 107 are in lowered position, the bottom ends cooperate between the respective slides 48 and a bail member 108, which is carried upon swinging arms 109, which, in turn, are carried upon a shaft 111. At one end of the shaft 111 there is mounted a lever 112 as shown in Figs. 3, 5, 7, 12 and 15. The upper end of the lever 112 cooperates with a lever 114 which is pivoted upon the shaft 105. The lower end of the lever 114 cooperates with the tail of a pawl-carrying lever 127 as later described.

The designation mechanism includes as an essential part, a control shaft 115 as shown in Figs. 3, 7, 12 and 15 upon which is mounted a detent wheel 116 having nine detent notches, three of which are deeper than the other six, the deeper notches being symmetrically disposed around the

periphery of the wheel and separated from each other by two shallow notches. Upon the same shaft there is positioned a ratchet wheel 117, as shown in Figs. 3, 5 and 7, and a set of three cams 118, 119 and 121, also as shown in Fig. 7. Cooperating with the detent wheel 116 is a detent lever arm 122, pivoted upon a shaft 123. The detent lever arm 122 is held in engagement with the detent wheel 116 by means of a spring 124, and the tail of the detent lever arm 122 has an interponent member 125, which cooperates with a pin 126 on the lower end of the lever 114.

Upon the same shaft 123 there is journaled a lever 127 carrying a pawl member 128 adapted to cooperate with the ratchet wheel 117. The lever 127 has thereunder a push rod 129 operated from a cam 130 fixedly mounted on the main shaft 35 as shown in Fig. 7. The tail of lever 127 is formed with an extension 131 adapted to cooperate with the lower end of the lever 114 and also is provided with a pin member 132 adapted to cooperate with the lower end of lever 104 (Fig. 12). The horizontal arm 133 of the lever 103 also cooperates with the detent wheel 116 as shown in Figs. 12 and 15.

A third lever arm 134 mounted upon a shaft 135, as is particularly well shown in Fig. 13, also cooperates with the detent wheel 116. The shaft 135 is mounted in the frame over the base portion 10 and has a continuation shaft 136, mounted in the frame 51 of the connection basket 20, and coupled thereto by a pair of arms 137, having a pin and slot pair 138, as is particularly well shown in Fig. 13. The inner end of the shaft 136 has a lever 139 which is adapted to block movement of the arm 86 as shown.

The cam 118 on the shaft 115 (Fig. 7) controls the card feeding by means of the lever 141 which operates a link 142 and lever 143 on a shaft 144 to interpose a lock 145 in the path of the pull rod 146 which operates the card feed shaft 147. The cam 119 has two levers cooperating therewith, one lever 151 on shaft 152 being adapted to operate levers 153 carrying a bail 154 which operates the locking slides 45 to release the interponent pins 45 when the cam is operative.

A second lever 155 cooperating with the cam 119 operates another lever 156 through a shaft 157, and by means of a link 158 operates a lever 159 which lowers the card gate 161 to closed position.

The third cam 121 on the shaft 115 is the total cam and cooperates with a lever 162 to which is attached the total link 163, which, when pulled, causes the transfer of totals from the algebraic accumulator to the summation accumulator.

Thus for single totaling, the pawl 128 and lever 127 make three successive strokes during three successive cycles of the machine, the first stroke initiating the well known blank cycle necessary in machines of this kind for restoring any transfer mechanism which may have been tripped, thereby conditioning the accumulators for total-taking, the second stroke providing the total taking cycle, and the third stroke returning the mechanism to accumulating position at the instant when the sensing pins have read the data of the next record card thereby preserving this data for the printed record. However, if by any means the lever 127 is prevented from making the third of these strokes, repeated total cycles will be obtained, which in the present instance serve for the repeated transfer of the running balance as above outlined. For this purpose, the lower end of lever 104 (Fig. 12) cooperates with the pin 132 on the tail of lever 127, holding it at the top of its stroke and preventing a downward movement for engagement with another ratchet tooth to advance the cam assembly to accumulating position. The lever 104 is moved to bring its bottom end into engagement with the pin 132 by the action of the lever 106, carried upon the lever 103, when the follower roller on the horizontal portion 133 of lever 103 enters the deeper depression in the detent disc 116. The lever 104 is held in position to engage the pin 132 and accordingly, the cam assembly is maintained stationary in total-taking position until the lever 106 is moved by the pin 102 on the lever 101 and shaft 99 journaled in the bearings as shown and actuated by the lever 98 and link 97 when the feeler pins 66 enter perforations in the drum 73 (as shown in Fig. 12). Thereupon, the pin 102 moves the lever 106 out of engagement with the lever 104 which thereupon is moved by a spring as shown out of engagement with the pin 132, and the lever 127 falls, positioning the pawl 128 with a new ratchet tooth, whereupon the next rise of member 129 moves the cam assembly shaft 115 to accumulating position.

Tabulator head

As shown in Fig. 1 the tabulator head comprises six or seven accumulator sections I to VII (Fig. 1), six sections only being present in the event that an alphabetic printing unit is provided in place of the two numeric printing and accumulating sections I and II. These accumulator sections may be operated according to the single unit code, well known in the prior art (Fig. 3), or according to the multi-unit code as shown in Patent No. 1,780,621 (Figs. 2 and 8), and one or more of the sections may be equipped with an algebraic or direct subtraction accumulator of the type shown in the copending application, S. N. 535,842, filed in the names of Lasker and Ruiz. This construction is particularly well shown in Figs. 16 to 30 inclusive.

Referring to Fig. 16, sets of stops 170 are provided which may be constructed for the single unit code as shown in Fig.16, or preferably in accordance with the disclosure of Patent No. 1,780,621 as shown in Figs. 2 and 8. In the designation section (Fig. 8), these stops are operated by the connecting wires 56 which engage the slides 57 cooperating with the mechanical calendar as previously described. The designation section usually is not equipped with the auxiliary direct subtraction tabulator but may desirably be equipped with the designation control apparatus as shown in Patent No. 1,388,271. Obviously, if the mechanical calendar is adapted as indicated in Fig. 14 to the comparison of dates punched according to a multi-unit code, the designation printing section in the tabulator head must be equipped with a corresponding stop system. However, if, as is readily possible, the mechanical calendar is constructed to operate according to a single unit code, then the designation section is equipped with stops as shown in Figs. 3 and 16 according to the single unit code.

The appropriate accumulator sections, are equipped with the auxiliary algebraic or direct subtraction accumulator mechanism as shown in application S. N. 535,842, and if the requirements of the accounting problem make it desirable two or more such sections, so equipped may be controlled from different card fields; or if desired, by means of Y wires in the connection box,

two or more sections may be controlled thereby from a single card field.

As indicated, the arrangement and equipment of the accumulator sections, and the control of them through the connection basket depends upon the particular requirements of the individual accounting problem under consideration. In the problems to be solved by the system of the present invention, it may be desired to obtain merely a summation total of the day balances of the credits, which is done by one tabulator section; or it may be required that the day totals be recorded as well as the summation totals of the day balances, in which case, two sections are necessary, and they will be controlled in parallel from a single card filed by Y wires in the connection basket; or summation totals of both debits and credits may be required as well as day totals, in which case three sections are required, all three being controlled in parallel by Y wires in the connection basket. In each instance each of the sections is equipped with the usual summation accumulator and algebraic accumulator mechanisms.

Summation accumulators

The wires **54** in the connection basket **20** are held in operative relation to the stop baskets in the tabulator head, the several wires being arranged to lift the appropriate stop **170** in the stop basket. These stop baskets are well known in the art and may be of the customary form as shown in Figs. 2, 3, 8, 16 and 31.

Above the stop baskets there are provided the usual sets of sectors including the gear sectors **171**, each with a heel stop **172** adapted to cooperate with a row of stops **170** in the stop basket, and a type sector **173** coupled to the sector **171** in the usual manner. The usual sets of main or summation accumulator wheels **174** are likewise provided, and mounted on the axle **175** which, in turn, is rocked by the cams **176**, these cams, in turn, being controlled through the pitman **177** from the shaft and rocker mechanism **178**, and the action cam, or fan cam, **179** on the action shaft **181**. The position of the pitman is controlled by the totaling mechanism as shown in Fig. 23 and later described. The usual platen **180** is likewise provided, together with the usual printing hammer mechanism as shown in the previously mentioned cross reference patents.

The algebraic accumulator mechanism is carried upon cross rails **182**, in frames **183**, all as particularly shown in Figs. 16 and 17.

The algebraic accumulators

The algebraic accumulator mechanism includes a set of accumulator gears **184** which may desirably have twenty teeth and two carry teeth **231**, as shown in Fig. 17. The accumulator gears **184** are carried upon a shaft **185** which, in turn, is mounted upon movable bearers **186** (Figs. 18 and 19). Sets of actuating racks **187** and **188** are provided, respectively above and below the accumulator wheels **184** and the respective pairs of racks **187** and **188** are coupled to operating members **189** which, in turn, are coupled to the sectors **173**, and through them are controllable by the sectors **171**, which are positioned by the stops in the stop basket shown. The lower set of racks **188** serve for addition and credit totals, and the upper set **187** serve for subtraction and debit totals.

The direction of movement of the bearers **186** for engaging the accumulator wheels **184** with the operating racks is controlled by the mechanism shown in detail in Figs. 18 and 19. The bearers **186** are coupled to T-shaped levers **194** which are pivoted on the shaft **195** mounted in the frame **183**. The bearers **186** are held in mid-position, with the accumulator gears **184** out of engagement with the racks **187** and **188**, by means of springs **196** acting through levers **197** which operate on pins **198** and **199**. The T-lever **194** has at opposite ends of its head portion, a pair of pins **201** and **202** which are adapted to cooperate with another T-head member **203**, the shank of which is pivoted to an arm **204** on the shaft **205**, which arm is operated by the auxiliary lever **206** against the pull of a spring **207**. The T-lever **203** is pulled toward the right by the spring **207** and engagement between it and the pin **201** causes the accumulator wheel **184** to move down into engagement with the racks **188**; while engagement of the T-head member **203** with the pin **202** causes the accumulator wheels **184** to move upward into engagement with the racks **187**. The position of the T-head member **203** is controlled by the lever **1210** through a link **208**. The lever **1210**, the link **208**, and the T-head member **203** ordinarily tend to move upward under the urge of the spring **209**, but may be reversed for subtraction by reason of connection wire **212** which raises the block **211** and rocks the lever **210** which is fixed, as is lever **1210**, to shaft **213**. When a debit amount is indicated by a perforation in the data card, the above mechanism operates to condition the accumulator wheels **184** for engagement with the subtraction racks **187**.

Operation of the accumulator-wheel-engaging shaft **205** is obtained by the mechanism shown in Figs. 20, 21 and 24. At one end of the shaft **205**, there is provided a lever member **214** having a pitman **215** coupled thereto as shown. The pitman has thereon a pin **216** adapted to cooperate with either one of the levers **217** or **218** which, in turn, are actuated by the cam **219** on the action shaft **221**. The pin **216** is normally held in engagement with the lever **218** for accumulating timing by means of the lever **222** which, in turn, is operated from the totaling mechanism by the shaft **223**, lever **224** and link **225**. During the taking of a grand total or a summation total the accumulator wheels **184** are locked out of engagement with their racks by means of the lock member **226** shown in Figs. 20, 21 and 24, which is actuated by a link **227**, an arm **28** and a shaft **229** from the grand totaling mechanism.

Tens carry mechanism

Tens carry mechanism is also provided in the algebraic accumulator, and, associated with the tens carry mechanism there is provided a group of mechanisms for control of the direction of engagement of the accumulator wheels with one or the other of the sets of actuating racks **187** and **188** during totaling operation, in order to insure correct digital readings, and avoid the taking of totals in the undesired form of nines complements (except in the second form of the problem).

The tens carry mechanism consists of pairs of carry teeth **231** (Fig. 17) on each of the accumulator wheels **184** which carry teeth cooperate with carry hook members **232** in the tens carry mechanism. The carry hook members **232**, of which there are upper and lower sets provided, have in each set one less carry hook than the number of accumulator wheels. Each of the carry hook

members 232 is pivoted on a lever member 233 as shown in Fig. 22. The levers 233 are journalled upon upper and lower shafts 234, and the hook members 232 are adapted to engage respectively under and over the cross bar members 235 (Fig. 17) and to be released therefrom by rotation of the teeth 231 against the respective hooks 232. Each of the swinging levers 233 is provided with a catch member 236 which cooperates with a stop member 237 on each of the respective next higher order racks 187 and 188. Thus when no tens carry occurs, the racks 187 are halted when the indicated number of teeth have cooperated with the teeth on the accumulator wheel, whereas when a tens carry is required the appropriate rack member is not arrested by engagement of the catch 236 with the stop 237 because of the fact that the lever 233 has been raised by the next lower order carry tooth to remove the catch 236 out of the path of the stop 237 allowing it to move the one extra tooth as required for tens carry.

Debit or credit total control

The highest order wheel, of course, cannot carry a ten to any higher order wheel, and, accordingly, as far as tens carry is concerned, no mechanism is necessary. However, the position of the highest order wheel may be utilized to control a member which, by its setting, will indicate whether a negative or positive amount is standing on the accumulator wheels. This is possible because of the fact that when the wheels have had a positive or credit total taken, they are positive clear, and at zero setting with respect to the lower carry stops, but are set at nine with regard to the upper carry stops, being nines complement setting. Accordingly, when, during subtraction, the debits exceed the credits, a tens carry occurs, which moves all of the higher order wheels, above those recording accumulated numbers, by one tooth, from nine position to zero, which is negative clear, preparatory to a negative total to record the amounts in the lower order wheels. Also, the fugitive one is included at the same time.

For this purpose, auxiliary hook members 238, pivoted upon levers 239 are provided in each algebraic section as shown in Fig. 22. These auxiliary hook members are positioned adjacent the carry teeth of the highest order wheel 184, for both the upper and lower racks 187 and 188, and each hook engages with the appropriate cross bar 235, the carry teeth 231 of the highest order accumulator wheels cooperating with the respective auxiliary hook members 238. Movement of the racks in a subtractive sense sufficient to accumulate a negative or debit amount in the accumulator wheels will produce subtractive carries, and will thereby, cause movement of the highest order accumulator wheel from nine to naught position as above described, thereby releasing the auxiliary hook member 238 and allowing the lever member 239 to swing, carrying with it the lever 241 through the bar 242 and releasing the rack of the lowest order for the insertion of the required fugitive one. Simultaneously, movement of either bar 242 actuates the rod member 243, upward or downward according to whether the lower or upper bar 242 was moved, to indicate whether the amount accumulated is a credit or a debit. Movement of the rod 243 moves the lever 244, and the shaft 245 which is held against random influences by a detent member 246. On the shaft 245 there is fixedly mounted a lever 247 carrying a block member 248 which is adapted to cooperate with a lever member 249 on a shaft 251. The shaft 251 carries two other levers, one lever 252 cooperating with lever 1210 to depress the member 203 for causing engagement of the accumulator wheels with the subtraction rack, the other lever 253 being adapted to cooperate with the block 211 on the connection wire 212. This mechanism is adapted to cooperate with a total transfer card for the taking of a debit or a credit total, the arrangement being that the total transfer cards contain perforations for causing the lever 253 to be raised, the lever 252 to be depressed and the T lever 203 to be positioned for a debit total. However, if a credit amount is recorded in the accumulator wheels, the block 248 is swung downward into the path of the lever 249 and thereby prevents movement of the levers 253 and 252, allowing the T lever 203 to remain in position for causing engagement of the accumulator wheels with the positive or additive racks and yield a credit total.

For transfer totaling without the total card, as in the present instance, a spring 254 is connected between the lever 253 and a lever 255 which is, in turn, connected by a link 250 (Fig. 17) to the lever 141 (Fig. 7). Thus when the lever 141 is actuated for the spacing stroke in a total operation, the spring 254 tends to raise the lever 253 in substitution for the lifting effect otherwise produced by the block 211 mounted on the wire 212 which block moves in response to a perforation in the algebraic space and total cards.

By this structure the accumulator wheels 184 are engaged with the proper racks 187, 188 during the spacing stroke to give a correct total, and they remain so engaged for the total stroke.

Types of totals

As will be obvious from a consideration of the various aspects of the problem pointed out at the beginning of this specification, a minimum of three types of total-taking operations is required; that is, from the algebraic or rear accumulators, it must be possible to transfer a total to the front or summation accumulator without clearing, it must further be possible to transfer a total from the algebraic accumulator with clearing; and it must be possible to take a total from the front or summation accumulator with clearing.

The taking of a total from the algebraic accumulator is accomplished by the mechanism of Figs. 20 and 21. The initiation of a totaling operation occurs when the total link 163 (Figs. 2, 3, and 23) is pulled by actuation of the designation sensing mechanism. The link 163 swings the lever 266 and total shaft 265 to actuate the lever 260 and the link 225, and with them the shaft 223 (Fig. 20) and lever 222 which by a counterclockwise movement allows the lever 215 to move upward, carrying with it the pin 216, into position to engage with the lever 217 which permits the wheels 184 to remain in engagement with the appropriate racks at the beginning of the total stroke (Fig. 22), as determined by the position of the rod 243. This normally provides a total with clearing since the wheels are disengaged from the racks immediately after printing. The total without clearing is obtained by a mechanism later described.

For the control of the front or summation accumulator, the mechanism of Fig. 23 is provided. In this figure the gear sectors 171 and the type sectors 173 are shown as before, and also the coupling members 189 which actuate the algebraic accumulator. The front accumu-

lator wheels 174 on the shaft 175, under the control of the cam 176 and the pitman 177, are likewise shown. The pitman 177 is controlled by the pins 256 and 257 on a rocker lever 258, which in turn is mounted upon the shaft 178, which also carries the lever 259 and its associated mechanism which cooperates with the fan cam 179 on the action shaft 181. The position of the pitman 177 is controlled through the agency of a link 261 and spring 262 which cooperate between the pitman 177 and a lever member 263 on a sleeve 264 which is journaled upon the subtotal shaft 265.

The subtotal shaft 265 is actuated by a lever member 266 to which the total link 163 is coupled. The subtotal shaft 265 is the normal tabulator total shaft which serves for the control of the designation printing sections, and for the totaling from other accumulator sections. An auxiliary total shaft 267 is provided upon which is mounted a lever member 268 which cooperates with a pin 269 on the lever 263 to lock that lever and pitman 177 in neutral position. The shaft 267 has thereon a second lever 271 upon the end of which there is a pin cooperating with a slot in a link 272, which in turn is coupled to a lever 273 attached to the sleeve 264 for the operation of the lever 263. A third lever 274 on the shaft 267 cooperates with a spring 275 which tends to hold the shaft 267 in its normal or unoperated position. A fourth lever 276 on the shaft 267 cooperates with a link 277, which in turn cooperates with a lever 278 on the shaft 229, as shown in Figs. 20, 21 and 24 to 28 inclusive.

The lever 263 on the sleeve 264 is also arranged to be actuated by means of a latch member 279, which is carried upon the lever member 273, and cooperates with a catch member 281 journaled upon the shaft 265. The member 281 carries a pin 282 which cooperates with the fan cam 179 at the extreme advanced position of the cam. The latch member 279 also carries a pin member 283 which cooperates with a lever member 284 attached to the shaft 265. The shaft 265 also carries a lever 285, having thereon a pin 286 which acts to lift the lever 268, and thereby releases the pin 269 to permit the lever 263, the link 261 and the pitman 177 to be drawn upward by means of the spring member 287. By this mechanism, the pitman 177 is drawn into neutral position when the total link 163 is not pulled, thereby preventing accumulation of any numbers in the accumulator wheels 174; the lever 263, link 261 and pitman 177 are allowed to assume the accumulating position when the total link 163 is pulled, and the same assemblage of members are drawn into totaling position when the total link 277 is pulled. This provides for the operation of transferring totals, but does not distinguish between a total transferred from the algebraic accumulator without clearing, or one transferred with clearing.

The total link 163 is pulled by the change-of-designation mechanism previously described, and the summation total link 277 is pulled by other mechanism, shown in Figs. 25–28 inclusive.

Summation total, or grand total

The final interest summation total is taken when the link 277 is pulled to rotate the shaft 267. This link cooperates between a lever 276 on a shaft 267, and a lever 278 (Fig. 30) on the shaft 229, as shown in Figs. 20, 21 and 24–28 inclusive. (It should be noted that in Fig. 24 which is an isometric projection, shafts 223 and 229 lie nearly in the same line, and should not be confused. The differentiation is clearly shown in Figs. 26–28 inclusive.) Movement of the shaft 267 when the link 277 is pulled, moves the lever 271, pushes the link 272, and rotates the sleeve 264, to bring the lever 263 into its lowest position, which carries the link 261 downward and thereby draws the pitman 177 into totaling position, preparatory to the taking of the summation total.

The shaft 229 as shown in Figs. 24 to 28 inclusive, is actuated by means of a lever 288 attached thereto. A link member 289, pivoted to the end of the lever 288, has a catch at the opposite end, as shown, and a pin 291 attached to a depending finger portion. The catch member, on the link 289, cooperates with a lever member 292 which has a follower roll member 293 cooperating with the cam 294 mounted on the operating shaft 221. A spring member 295 is provided cooperating between the end of the link 289 and the lever 292 to hold the latch portion of the link out of engagement with the finger 296 on the lever 292. The catch on the link 289 is moved into and out of engagement with the finger 296 on the lever 289 by means of an offset lever 297, which in turn is actuated by a connection wire 298 in the connection basket 20 when a summation total card is sensed in the sensing chamber. By this mechanism, the appearance of a summation total card in the stack of data cards causes the link 277, as shown in Fig. 23, to be pulled for the taking of a grand or summation total.

Algebraic totals

As previously pointed out, the totals taken from the algebraic accumulator must be of two kinds; consecutive or read totals without clearing, or ordinary totals with clearing. The ordinary algebraic total with clearing is taken by the mechanism as previously described. The consecutive totals, without clearing, are obtained by the operation of the mechanism shown in particular detail in Fig. 29.

In this figure, a slide member 301, having a finger 302 is carried upon a frame 303. The finger 302 is adapted to cooperate with the end of the T lever 203 to which the bearer rods 186 are attached; movement of the slide 301 and finger 302, serving to hold the lever 203 and bearer rods 186 in either fully lowered, or fully raised position, thereby holding the accumulator gears in engagement with the appropriate racks through an entire total-taking cycle, to return into the accumulator wheels the amount of the total, rather than to permit disengagement of the accumulator wheels from the racks in cleared position at the mid point of the totaling cycle.

The slide 301 is actuated by a lever member 304 attached to a shaft 305. The lever 304 carries a pin 306 which cooperates with the slot shown in the slide 301. A spring member 307 holds the pin 306 against one end of the slot, and provides a yielding connection between the lever 304 and the slide 301, so that the slide can be blocked out of operation under certain conditions. The shaft 305 is rotated by a lever 308 and push rod assembly 309 from a lever 311 which is mounted upon the total shaft 265. Thus movement of the total shaft 265, when the total link 163 is pulled, advances the slide 301 to bring the finger 302 into cooperation with the lever 203 to cause the taking of a consecutive or read total,

as required, without clearing the accumulator wheels.

For the taking of a total with clearing, the lever **312** is moved by a tray pin **314** actuated from a wire in the connection basket when a special "total with clearing" card is reached at the end of the stack of data cards. Movement of the lever **312** interposes a pin **315** into the path of a projection **316** on the slide **301**, thereby preventing advancement of the finger **302**, and leaving the lever **203** free to move to withdraw the accumulator wheels from the operating racks in cleared position at the mid point of the totaling cycle.

The lock lever **317**, when pulled to the right, as shown in Fig. 29, interposes a pin **318** into the path of a projection **319** on the end of a slide **301**, and thereby prevents movement of the slide to interpose the finger **302** in the path of lever **203**. Thus, the lever **317**, when pulled to the right and locked, causes all totals taken from the algebraic accumulator, to be taken with clearing.

Zero stops

When a total of any grade or character is taken, it is necessary that the automatic zero stops **321**, cooperating with the digit stops **170**, be disabled. The mechanism for this purpose is particularly well shown in Fig. 24. The automatic zero stops are shown at **321** in Figs. 2, 3, 8, 16, 26, 27, 28 and 31 and, in particular, in Fig. 24. These automatic zero stops are controlled by mechanism on the shaft **223**, the stops **321** being controlled by a comb plate **322**, which is moved sidewise by means of a pin **323** which is operated by a cam block **324**, which, in turn, is operated alternatively by the pin **325** carried by lever **326** on the shaft **229**, when a summation total or grand total is taken, or by the pin **327** carried by lever **328** on the shaft **223**, when a total is taken from the algebraic accumulator. A similar mechanism serves, as shown in Figs 2 and 8, for control of the automatic zero stops when the stop basket system for the multi-unit code is used.

Summation total

It will be noted that the structure, shown in Fig. **23**, provides means for insuring an accumulating cycle of the accumulators **175** during a totaling cycle of the algebraic accumulators, and insures disengagement of the accumulators **175** during accumulating cycles of the algebraic accumulator. It is, however, necessary in addition that the algebraic accumulator wheels **184** be held in disengaged position during the taking of the total from the summation accumulator wheels **175**. This is obtained by the structure shown in Figs. 20, 21 and 24 in which the latch member **226** is operated by the link **227** and lever **228** from the shaft **229**, which is rotated when a summation total is taken. The latch **226** cooperates with the lever **214** on shaft **205**, as is particularly shown in Figs. 20 and 21, to hold the T-lever **203** (Fig. 24) in disengaged position, thus preventing engagement of the accumulator wheels **184** with either of the racks **187** or **188**.

Debit and credit totals

The algebraic accumulator is adapted to the direct subtraction of debit amounts and the direct addition of credit amounts. Accordingly, if the debit amounts exceeded the credit amounts, a debit will be accumulated in the algebraic accumulator. In the ordinary operation of a tabulator with this type of algebraic accumulator, it is desired that both the debit and credit amounts shall be printed in the form of normal figures. For this purpose, the mechanism, shown in Fig. 22, is provided. As shown, the carry pawls **238**, associated with the highest order accumulator wheel, are mounted upon the swinging frames **239**, which, in turn, carry the latch members **236** respectively, cooperating with the racks **187** and **188** which actuate the lowest order accumulator wheel. Thus, when the accumulator wheels are repeatedly engaged with the upper racks **187** for subtraction, to the extent that debit amounts are accumulated in excess of the previously accumulated credit amounts, the highest order accumulator wheel passes from 9 to 0, or from positive clear to negative clear, as previously described, thereby actuating the highest order tens carry mechanism, including lever **239**, cross member **242** and lever **241**, which, in turn, releases the stop **237** and allows the subtraction units-rack **187** to move one extra tooth to introduce the necessary fugitive one. In so doing, the swinging movement of the frame **239** depresses the rod **243** to swing the lever **244** to rotate the shaft **245**, and bring the block member **248** out of the path of movement of the lever **249**. This allows the movement of the shaft **251**, allows the lever **252** to move to lowered position, and forces down the lever **207** against the spring **209**, thereby lowering the T-lever **203** to engage with the pin **202**, thus causing the accumulator wheels to be engaged for totaling with the subtraction rack, thus giving a normal debit total. Similarly, if the amount is a credit, the tens carry mechanism associated with the additive racks **188** introduces a fugitive 1 in the reverse direction, which cancels the fugitive 1 introduced in the course of subtraction, and simultaneously raises the rod **243** to permit the taking of a direct credit total.

Separate debit and credit summation

The first form of the problem as above presented, in which no overdrafts occur, avoids the necessity for selective summation of debit and credit balance amounts. In a machine set up for this first mentioned problem, only two accumulator sections need be equipped with the direct subtraction accumulator and the control mechanism above described. In handling this problem, one accumulator section gives the respective day's transaction amounts. These amounts may be debit or credit, negative or positive, according as the transactions of any given day are predominantly debit or credit. In this section, the direct subtraction accumulator member only is used for the successive day's balances, no summation being ordinarily carried in the main accumulator. The other accumulator section is equipped for the summation procedure in its summation accumulator and the carrying of the running balance in its direct subtraction accumulator. However, since no overdrafts are allowed, the accumulator will always contain a positive balance, and, accordingly, all totals taken from it are positive and the mechanism for determining whether a positive or negative total is to be taken is not called upon to function.

In the second of the problems above described, in which the interest rate charged on overdrafts is the same as that paid on deposits, two accumulator sections may be provided as was the case in the solution of the first problem. It should be noted that the main or summation accumulator is not equipped for direct subtraction of transferred debit amounts. However, by the

use of nines complements, debit balances can be obtained from the summation as required by the conditions of the problem. In order to perform subtraction by the addition of nines complements, the total taking mechanism of the algebraic accumulator is arranged so that all totals are taken with the accumulator wheels in engagement with the additive racks. When these algebraic accumulators carry a debit amount, the total taken by the additive racks is in the form of a nines complement, which is transferred to the summation accumulator, provision being made for the fugitive 1 in an appropriate manner, as by a connection between the shaft **245** (Fig. 22) and the carry stop of the lowest order sector **171**. For this purpose, the lever **252** of Fig. 22 may be blocked in raised position in any convenient way.

In the solution of the third form of the problem, it is required that the debit balance amounts and credit balance amounts be accumulated in separate summation accumulators. For this purpose, three accumulator sections are required, one to accumulate the day transaction amounts, one to summarize the credit balances, and the third to summarize the debit balances. In this form, the same balance is carried in both the second and third accumulator sections, and the balance is accumulated in one or the other of the summation accumulators, according as it is debit or credit, as shown in the previous ledger sheet.

For this purpose, the second and third of the accumulators are equipped with a mechanism shown in detail in Figs. 16, 17, 22 and 23. This mechanism consists of lever **328** which is positioned upon the shaft **245**, and set, with this shaft, by the movements of the rod **243** as determined by the tens carry mechanism associated with the highest order accumulator wheel as above described. Connected to this lever **328** is a link member **329**. This link member passes through the stop baskets of the respective accumulator sections, cooperating with the stops which set the "character of transaction" printing section, as shown in Fig. 31. Adjacent a convenient pair of stops there is provided on the link member **329** a cam **331**, which cooperates with side pins **332** respectively mounted on appropriate ones of the stops **170**. Conveniently, the stops in the **7** and **8** position, or in the **6** or **7** position may be utilized. The end of the lever **329** cooperates with a latch lever member **333** journaled upon a convenient shaft. The latch lever cooperates with the pin **334** upon the lever **263**. The pivot for attaching the link **329** to the latch lever **333** may desirably have two pivot positions attaching it, one position being such that the lever **333** is disengaged from the pin **334** when the link **329** is to the left, and the other such that the lever **333** is disengaged from the pin **334** when the link **329** is moved to the right. As is particularly well shown in Figs. 23 and 32, the lever **333** is formed with a bent-over top end in the form of a cover which can be positioned over the pins **334** or can be positioned to one side or the other of the pin **334**.

This mechanism will hold the lever **263** in mid-position by engagement of the latch lever **333** with the pin **334**, thereby holding the pitman **177** in neutral position, and maintaining the accumulator wheels **174** out of engagement with the rack **171**. Since the same balance is carried in the accumuluator wheels **184** for both the second and third accumulators, the respective latch levers **333** are arranged so that simultaneous movement of the two levers **329** of the respective accumulators draws one or the other of the latch levers **333** into engagement with the respective pins **334**, and thus, one or the other of the summation accumulators will be held in non-accumulating position, without regard to the movements of the timing levers as illustrated in Fig. 23. Accordingly, while the same running balance is carried in the two algebraic accumulators, it is transferred to only one summation accumulator at a time, which one depending upon whether it is a debit or a credit amount. By this construction, the debit balances are summarized in one accumulator section and the credit balances are summarized in another accumulator section.

Operation of the machine

In the operation of this system and machine, the first step is the preparation of the transaction cards. This may be accomplished by any convenient form of punch mechanism and is preferably done at about the time of the transactions. At the end of the desired interest period, the transaction cards for the period, usually a month, are sorted, first according to customers, using the customer's account number as an index, or, if only the customer's name is indicated on the card, the sorting may be accomplished by the use of the alphabetic code perforations. Each customer's transaction cards are then sorted in chronological sequence.

During the course of the interest period, balance cards are prepared from the business records of the previous interest period, which balance cards will show the amount of the customer's balance at the beginning of the current interest period, whether debit or credit. This balance card is provided with the special perforation to actuate the zero blocks and thereby prevent accumulation in the day transaction accumulator, then placed at the bottom of the group of cards representing the customer's day by day transactions, there being no cards for the days when no transactions occurred.

The necessary control cards comprising the last day card, the clearing card, the space card and the summation total card are then laid successively in the order named, on the top of the group of customer's cards. The groups of cards are then carried to the tabulator (Fig. 1) and placed in the supply magazine **37** with the usual weight member thereon to insure feeding. The tabulator is started in the usual manner by closing the switch in the electric motor power supply circuit, whereupon the mechanical clutch, if any, is engaged. The tabulator thereupon begins operation, by movement of the shaft **35** and the lever **39**, (Fig. 2) which actuates the picker knife **38** to feed the bottom card of the stack in the magazine **37** to the feed rolls **41**, which pass the card into the sensing chamber **36**. Rotation of the shaft **35** carries the sensing pin box **31** upward, and the card stop is interposed into the path of the card entering the sensing chamber **36**, and stops the card in proper sensing position. Continued upward movement of the basket **31** brings the sensing pins **32** into contact with the card (Fig. 2) and such of the pins as find record perforations in the card pass therethrough and are locked in raised position by the slides **33** (Fig. 4) when they are shifted by the actuating lever shown, as it passes off the high portion of the cam. Locking of the pins which find perforations carries them upward with considerable force into contact with pins **45**,

moving these pins upward. At the top of the stroke, the raised interponents 45 are locked by engagement of the locking pins 46 with the catches in the slides 47 (Fig. 4). It is customary always to actuate the total mechanism of the tabulator at the close of a run to make sure that a final total has been taken, hence, all of the pins 45 will be left in lowered position and, accordingly when the next card is sensed, the raising of pins 45 in the designation field will carry the designation pins 45 upward and cause a sidewise movement of the designation slides 48.

Before the tabulating operation has been started, the appropriate slides 107 have been depressed by the finger levers 110 as shown in Figs. 6 and 7 to bring the blocking ends 107, between the ends of the slides 48, associated with the designation field, or date field, and the cross bar 108. Accordingly, the sidewise movement of the slides 48, moves the lower ends of the levers 107 and thereby the cross bar 108, and rotates the shaft 111 to initiate the taking of another total (Figs. 4 and 7). As shown in Figs. 3, 4, 5, 7, 12 and 15, rotation of the shaft 111 moves the lever 112 in a counterclockwise direction (clockwise in Fig. 3) to swing the lever 114 also in counter clockwise direction (clockwise in Fig. 3), thereby moving the pin 126 at the lower end of the lever 114 sidewise out of the path of the tail 131 of lever 127, and permitting it to drop downward with the actuating bar 129. The actuating pawl 128 is thus brought under another tooth of the ratchet wheel 117, and when the actuating bar 129 rises during the next cycle this ratchet is rotated through one-ninth of a revolution, turning with it the shaft 115 and the series of cams 118, 119 and 121, as particularly shown in Fig. 7. This one-ninth revolution of the ratchet 117 and its coacting shaft and cams causes the following sequence of operations to occur (see Fig. 7):

The cam 118 swings the lever 141 to move the rod 142, lever 143 and shaft 144 to swing the latch member 145 into engagement with the tie link 146. This engagement prevents the actuation of this link and thereby prevents further feeding of the cards until this latch is released. Simultaneously, the cam 119 swings the lever 151 to move the shaft 152, and with it the levers 153 and the cross bar or bail 154. The bail 154 functions to move all of the slides 47 sidewise and release all of the engaged pins 46 and respective associated interponents 45. The sensing pin box 31 moves rapidly downward and thus permits the interponents 45 to resume their lowered position, freeing the tabulator members of the reading in this first card. In addition to the above, the cam 119 also swings the lever 155 to rotate the shaft 157, which, through the lever 156, link 158 and lever 159 closes the card gate 161 to retain this first card in the sensing chamber. The tabulator then completes the cycle which serves as the clearing stroke which is always a preliminary to the taking of a total. Thereupon, the ratchet actuating bar 129 drops downward following its cam, and, the tail 131 of the ratchet lever 127 being free of the lever 114 moves downward to carry the ratchet 128 under a second tooth of the ratchet wheel 117. The next rise of the bar 129, causes the pawl 128 to move the ratchet wheel 117 one more tooth and its connected cam assembly another one-ninth of a revolution. At the close of this movement, the lever 141 is still in actuated position as are the levers 151 and 155. However, in turning, the cam 121 actuates the lever 162 to pull the total link 163 which, in turn, rocks the total shaft 265 (Figs. 2, 3, 16, 17, 23 and 30) for the taking of a total. Since, however, all of the accumulators stand clear because of previous totaling, no printing or transferring of totals occurs. Thereupon, the pin 126 being still held out of engagement with the tail 131 of the lever 128 by the locking lever 122, the actuating rod 129 again moves downward. The lever 127 swings to carry pawl 128 under a third tooth. When the actuating rod 129 again rises the ratchet 117 and its assembly of cams are moved another one-ninth of a rotation, thereby returning the levers 141, 155, 151 and 162 and their respective associated mechanisms to accumulating position. Thereupon, the basket 31, making a third stroke, again carries the pins 44 upward for the first accumulating stroke.

It will be observed that in the designation field, as in the other fields, the slides 48 are actuated at each stroke by the upward movement of the interponents 45, but since the function of these slides is merely to release the tail 131 of the lever 127, and that lever is held released by the tail 125 of lever 122 during the entire totaling procedure, this movement is of no consequence, and the last movement occurs just at the beginning of an accumulating cycle slightly before the lever 114 relocks the tail of lever 127. Accordingly, the cross bar 108 does not initiate another total taking cycle. Simultaneously with the third event of a tabulation operation, the interponents 45, the connection wires 54 in the connection basket 20 and the sector stops 170 (Figs. 2, 3, 16, 17 and 23) are raised by the upward force applied to them by the rising sensing mechanism and are locked by slides 47. Sector stops 170 are thus placed in position to cooperate with the heels of the sectors 171. Thereupon, the usual bails, as shown, (but not numbered) allow the sectors 171 and type carriers 173 to swing until arrested by a raised stop 170, thus positioning the types according to the record on the card, whereafter the type hammers operate to cause printing.

It may be remarked that during card accumulating cycles the pitmans 177 of the summation accumulator sections are in neutral position, with the cams 176 swung to disengage the front accumulator wheels 174 from the sectors 171 and that these members are not actuated during a card accumulating cycle.

Associated with the sectors 171 and 173 and coupled thereto are the members 189 (as shown particularly in Fig. 17) and accordingly, they also are moved to the left by an amount determined by a raised stop 170. Movement of the members 189 causes movement of the rack members 187 and 188, positioning them according to the reading on the card, preparatory to engagement therewith of the accumulator wheels 184 for the accumulation of the indicated number from the card. The action shaft 181 as shown in Fig. 30 has carried the shaft 221 and cam portion 219 around preparatory to release of the lever 218 (Fig. 20), which, in turn, releases the pin 216 and the link 215 for movement to the right allowing the lever 214 to swing and rotate the shaft 205 in counterclockwise direction. As shown in Figs. 16, 18, 19, and 24, counter clockwise rotation of the shaft 205 permits the spring 207 to pull the link 203 toward the right.

If the first card or balance card is a credit as is often the case, the amount indicated thereon is to be added as a positive number into the accumulator wheels 184, and being a credit transaction, there is no debit perforation in the card. Accordingly, the lever 1210 (Figs. 18 and 19) is

not actuated but is held in raised position by the spring 209, and the link 203 is in engagement with the pin 201. Then, when the cam 219 releases the lever 218 (Figs. 20 and 21), the spring 207, pulling on the link 203 through the pin 201 rotates the shaft 195 in clockwise direction, pulling the carrier bar 186 downward and carrying with it the shaft 185 and the accumulator wheels 184 thereon downward into engagement with the lower racks 188 for addition. Thereupon, the bails, shown in Fig. 16, return the sectors 171 and 173 to zero position, carrying the members 189 and the racks 188 and 187 with them towards the right and moving the accumulator wheels 184 the number of teeth indicated by the printing and thus accumulating that amount therein.

As previously remarked, the amount indicated by the balance card must not be included under the total of the first day's transactions, and, accordingly, this card is punched with one or more zero perforations for the actuation of the naught block shown in Fig. 9. This naught block prevents actuation of any of the sectors in the day's total accumulator, since it holds the zero stops in normal, or elevated position, but it does not interfere with the accumulation of the amount in both of the running balance accumulators.

The sectors 171 and 173 having been returned to zero position, the continued rotation of the main shaft 35 causes the raising of the card gate 161, as shown in Fig. 7, an appropriate cam action thereby permits the first card to be carried onward to the rolls 42 and thence discharged to the receiving magazine 43. Simultaneously, the second card is caught by the picker knife 38, carried forward to the rolls 41, and fed by them into the sensing chamber 36, where its advance is blocked by the now lowered card stop 161.

Further rotation of the shaft 35 and eccentric 34 again raises the sensing pin box 31 and the pins 32 sense the second card in like manner to its predecessor, raising the interponents 45 in accordance with the indications of the perforations in the card. As before, the interponents 45 move the wires 54 in the translator basket to again set the stops 170. If the first card is a credit card, and the second card is a credit card for a transaction on the first day of the month, the cycle previously described including a printing of the amount is repeated without variation.

It may be noted that the slides 47 are not released by the bail 154 until the record card has been sensed, and the interponents 45 for the new reading have been raised, accordingly, if the second card has in its designation field the same record as the first card, the sensing pins 32 which rise in the designation field are the same as before, and they rise only under pins 45 which are already up from the previous card. Thus, when these pins 45 in the designation field are released by the slides 47, none of the designation pins 45 can drop and no others are raised, and accordingly, no movement of any of the slides 48 occur, no movement of the cross rod 108 (Fig. 4) is produced, and no actuation of the total taking mechanism occurs between the accumulations from cards having the same designation record.

Thereafter, a third card may be fed into the sensing chamber 36, and sensed. If, as may well occur, this third card represents another credit transaction, the above operations are repeated, but if it is a debit transaction, such as a withdrawal by check, the amount must be subtracted from the accumulator wheels rather than added. For this purpose, the fact that the amount indicated in the card is a debit is indicated by a special perforation in some convenient location on the card as shown in Fig. 31. This perforation causes the movement of an interponent 45 (which has no connection with a slide 48) and a wire 54 in the connection basket to raise the block 211, as shown in Fig. 19, and thereby swing the associated lever 210 clockwise to pull the link 203 into its lowered position and into engagement with the pin 202. Upon release of the shaft 205 by the lever 218, as shown in Fig. 20, the spring 207, pulling the several members shown, towards the right, causes the link 203 by engagement with the pins 202 to rotate the T member 194 and the shaft 195 in a counterclockwise direction, thereby lifting the carrier bars 186 and carrying upward the shaft 185 and with it the accumulator wheels 184 into engagement with the subtract racks 187 as shown in Figs. 16 and 17. Thereupon, the previously described events are repeated, ending with the clockwise rotation of the wheels 184 for subtracting the desired amount from the reading previously standing thereon.

This procedure is thereafter continued for the addition or subtraction of amounts as long as the cards continue to carry the same date or designation.

When, however, all of the cards for a given day have been tabulated, cards carrying another date, which may be the next sequential date, or may be a higher date, with several dates intervening, will appear.

In the event that the date is the next higher date in sequence, the change of date will be recognized by a movement of one or more of the slides 48 as shown in Fig. 4 to rotate the shaft 111 as before described for the initiation of a total-taking by the mechanism shown in Fig. 7. The same movements as previously described occur in this mechanism, including the pulling of the total link 163. When the link 163 is pulled, the mechanism of Fig. 23 is brought into play, together with the mechanism of Figs. 20 and 21, which are coupled as shown in Fig. 30.

This pulling of the total link 163 rocks the shaft 265, through the agency of the lever 266. Movement of the shaft 265, which occurs in a clockwise direction, carries the lever 285 upward, causing the pin 286 thereon to coact with the lever 268, moving it counterclockwise on the shaft 267 and releasing the pin 269, thereby permitting the spring 287 to rotate the lever 263 on its sleeve 264 in a counterclockwise direction and through the agency of the link 261 and spring 262 to lift the pitman 177 and thereby bring the notch on the upper edge thereof into engagement with the pin 256 on the rocker 233. Thereafter, engagement of the fan cam 179, on the actuating shaft 181, swings the lever 259 to rotate the shaft 178 and the lever 233 in clockwise direction, pushing the pitman 177, to the right, swinging the cams 176 to move the shaft 175 and the wheels 174 thereon downward out of engagement with the sectors 171. Substantially, this merely insures disengagement of the wheels 174 since they were previously disengaged. Simultaneously, movement of the shaft 265 swings the lever 260 and pushes the link 225 towards the right as shown in Fig. 23 (towards the left as shown in Fig. 30) to rotate the lever 224 and the shaft 223 counterclockwise as shown in Fig. 24. This counterclockwise movement permits the end of lever 222 to rise and with it the link 215, and the pin 216 to engage with the lever 217 instead of with lever 218.

At the beginning of the space and total cycles, movement of the cam 118, and lever 141 pulls the link 250 downward (Fig. 7) rotating the lever 255 (Fig. 17) and tensioning the spring 254, to pull upward on the lever 253. This occurs at the beginning of the space stroke, and accordingly the accumulator wheels are engaged with the racks 187 or 188 under the control of the mechanism shown in Fig. 22. If a credit balance is carried in the wheels, the block 248 is down, blocking the lever 249, and allowing the lever 1210 to remain raised under the pull of the spring 209, and the accumulator wheels are subject to engagement with the adding racks 188. If a debit balance is carried, the block 248 is up, and the spring 254 is free to swing the levers 252 and 1210 downward for engagement of the wheels 184 with the subtracting racks 187. Thus, the wheels 184 are engaged with the proper racks for the total-taking during the space cycle which immediately preceeds the total cycle.

At the beginning of the total cycle, the levers 217 and 218 are on the low portion of the cam 219, and the pin 216 therefore moves upward easily. Accordingly, with the pin 216 engaging the lever 217, when the cam 219, rotating on the shaft 221, actuates the said lever at mid point in the cycle, the link 215 moves towards the left rocking the shaft 205 clockwise as viewed in Figs. 20, 21 and 24 and conditioning the link 203 for movement. Upon further rotation of shaft 221 and cam 219, lever 217 is released and the tensioned spring 207 pulls the link 203 to the right, swinging the member 194 to move the carrier bar 186 to mid position, and bring the wheels 184 out of engagement if they are not otherwise blocked into engagement.

Simultaneously, with this series of operations, the zero stops, as shown in Fig. 24, are released by the cooperation of the block member 324 with the pin 327 to move the zero stops 321 to one side, thereby freeing the sectors 171. Thereafter, the bails free the sector 171 and they swing clockwise by an amount determined by the values indicated by the wheels 184. Thereupon, the printing hammers operate, to print the amount of the total. This amount of swing having been completed, the fan cam 179 (Fig. 23), engages the lever 259 from the left on its return swing and moves the pitman 177 to the left, pulling the cam 176 in the same direction to raise the shaft 175 and engage the accumulator wheels 174 with the racks of sectors 171, whereupon the return of these sectors, by the bail shown in Fig. 16, accumulates in wheels 174 the amount just obtained from the accumulator wheels 184.

The carrying of the running balance is obtained by the mechanism shown in Fig. 29. When the shaft 265 is rotated by pulling of the total link 163, it moves the lever 311, pushes the link 309 to move the lever 308 and rotate the shaft 305, thereby swinging the lever 304 in a clockwise direction. This motion tends to move the slide member 301 to the left to bring the blocking finger 302 into engagement with the T member 194 to hold the wheels in engagement with the racks with which they were engaged during the spacing stroke. The finger 302 being either above or below the left hand end of the member 194, the T member 194 and the links 186 do not move to disengage the accumulator wheels from their racks until the totaling cycle is completed by return of the sectors 171 to zero position. This return of the racks restores to the accumulator wheels 184, the amount standing upon them at the beginning of the total-taking cycle, which is the amount printed and accumulated in the summation accumulator.

For clarity of presentation of the produced ledger sheet, it is desirable that the successive items, and particularly the totals, be identified. The operation of the mechanism shown in Fig. 31 provides the appropriate indicia. This structure is conveniently included with each of the several tabulator sections utilized in the described procedure, with such changes in the type equipment as are appropriate for the different functions of the different sections.

When a credit transaction card is sensed, no special control perforations being present, none are found by the sensing pins, and accordingly, the indicia sectors 173 remain in their first position. As shown in the sample ledger page hereinabove, the indicia sector adjacent the designation section may print the indicia C to show that it is a credit. Likewise, when a debit card appears, the debit perforation is sensed and the corresponding connection wire 275*a* sets a stop 170 to position the type "D" for printing.

As above pointed out, the running balance is carried in two accumulator sets, in order that the debit balance and credit balance may be separately accumulated. To distinguish between debit and credit amounts, the mechanism shown in Figs. 16 and 17, is provided in which the lever 328, pivoted upon the shaft 245, has attached thereto a link member 329, which actuates a shoulder stop member 333 for the control of the lever members 263. As shown particularly in Fig. 17, the link member 329, by cooperation with the lever member 333, will swing it to one side or another, bringing the turned-over end of the lever into or out of engagement with the pin 334 on the lever 263. The length of the lever 333 is such as to hold the links 263 in neutral position against the pull of the spring 287. One of the shoulder levers 333 in one accumulation section moves from the right over the corresponding pin 334 and the other shoulder lever in the other accumulator section moves from the left over the corresponding pin 334. Accordingly, since both are controlled from corresponding shafts set in accordance with the same balance, one or the other will prevent movement of the corresponding lever 237, the one which is to remain active being determined by the presence of a debit or credit amount in the wheels 184. Accordingly, a balance is transferred from one set only of the wheels 184 to one set of the wheels 174.

Simultaneously, the cam 331 on the link 329, by cooperation with one or another of the pins 332 on the stop members 170, raises a stop into the path of the indicating sector 171 as shown in Fig. 31, to cause the positioning for printing of one or the other of the type members DB or CB for indicating whether a debit balance or credit balance was transferred.

At the mid point of the next succeeding cycle, the fan cam 179 strikes the pin 282 (Fig. 23) on the lever 281 and rotates the latch member 279 and with it the plate 273 clockwise to rotate the sleeve 264 and lower the lever 263 to neutral position where the latch 268, by catching the pin 269, holds it. The total transfer operation having been completed, the link 163 is released by the further rotation of the cam 121 to restore the accumulators to accumulating timing.

Thereafter, the next succeeding card is sensed

and the amount accumulated, and accumulating cycles continue until another change in date occurs by the appearance of a third day group of cards, whereupon the total transfer cycle, as just described, reoccurs.

This third day group of cards may have thereon a date not in sequence with the second group and this fact is determined by a mechanism best shown in Fig. 8.

As previously described, the fact of a difference in date is determined by the mechanism shown in Figs. 4, 5, 6 and 7, and a total-taking operation is initiated as before described. In connection with every card, the mechanism of Fig. 8 is operated but it influences the functioning of the machine only when there is a difference in dates, not that of immediate sequence.

As a part of the procedure of starting the tabulator into operation, the drum 73 is set by manual adjustment to bring the openings therein to such a position that the highest number indicated on the drum is opposite the feeler members 66. Thereafter, the initial totaling operation, as previously described, results in a movement of the drum, by the amount of one number, to bring the first date of the summation period opposite the feelers 66 at the time the first card is accumulated, ready for the following procedure:

When the card is sensed in the sensing chamber 36 by the pins 32, and the interponents 45 in the designating field are lifted, the wires 56, and slides 57, as shown in Fig. 8, are also lifted, raising the pins 59 and 65. Raising of the pins 59 moves the member 61 sidewise and cams the pin 62 downward, thereby moving the slide 63 downward, and when the wires 56 have been fully lifted, the member 91, cooperating with the cam 92 on the shaft 35, is lifted, thereby moving the lever 89, rotating the shaft 87 and moving the lever 86 counter clockwise to pull the link 88 to the left. Movement of the link 88 to the left carries with it the auxiliary frame 72 and the rods 67 allowing the feeler slides 66 also to move to the left under the urge of the springs shown. The pins 65 on one or two of the slides 57 will be raised according as an odd or even number is indicated. Accordingly, one or two of the feeler slides 66 in each card column in the designating, or date, field will be prevented from moving to the left. Movement of the link 88 and the auxiliary frame 72 carries with it the lever 96. The secondary frame 79, carrying the slot 83, remains in a position advanced to the right. Accordingly, the pin 84 on the cross-rail 69 is dropped downward into the slot 83, permitting the rail 69 to move downward out of engagement with the projections 68. Thereafter, all of the slides 66, which are not caught by raised pins 65, move to the left. Then, the cam 92' allows the push rod 91' to move downward and with it the lever 95, whereupon, the shaft 94 and lever 93 also rotate counterclockwise and the secondary frame 79 moves towards the left under the urge of the spring 90. This movement towards the left moves the slot 83 to cam the pin 84 upward and bring the cross-rail 69 into engagement with the projections 68, thereby locking the slides 66 in their respective positions, those which are held by raised pins 65, being advanced to the right, the others being moved to the left. Thereafter, the two slides 72 and 79 are moved to the right, together, through the agency of the cams 92 and 92'.

If the position of the drum 73 is such as to present to the slides 66 openings, as shown in Fig. 14, which correspond to the setting of the slides 66 by virtue of agreement between the date on the card, and the date setting of the drum so that the advanced slides enter openings in the drum, no relative displacement occurs between the auxiliary frame 72 and the secondary frame 79, and the pawl 77 remains down, out of engagement with the ratchet teeth 76. This occurs during the successive accumulations from cards bearing the same date number and does not effect the operation of the tabulator. When a different card group, with another date appears, a new setting of the wires 56 and the slides 66 is produced. This new setting, being for a different date, obviously the slides 66 will not enter the drum 73. Accordingly, when the auxiliary frame 72 advances, it moves but part of a stroke, whereas the secondary frame 79 makes a full stroke. This allows the pin 82 to move down the incline of the cam slot 81, and allows the pawl 77 to engage with a ratchet tooth 76 and move the drum forward one step. In the meantime, the designation controlled totaling mechanism of Fig. 7 is actuated as above described for the taking of a total, and the lever 134, as shown in Figs. 3, 12 and 13, enters the deeper notch in the detent wheel 116, bringing the lever member 139 (Figs. 8 and 13) into engagement with the lever 86 and preventing movement of the lever to follow the cam 92. Accordingly, during the clearing stroke no movement of the feeler pins 66 nor of the drum 73 is produced. During the totaling stroke, the lever 134 again rises to a higher notch in the detent wheel 116 and the lever 139 is moved out of engagement with the lever 86. During the totaling stroke, the interponents 45 and the wires 56 are raised briefly, again allowing time enough to permit of the setting of the slides 66 as before, before the interponents 45 are released, and the wires 56 dropped, and the slide 66 again tests the drum 73. If the sensed card has a date in sequence with the previous card, the pins 66 will enter the drum. If the dates are non-sequential, the pins 66 do not enter.

The mechanism of Fig. 12 then functions. When the detent wheel 116 is moved from the spacing stroke position to total stroke position, a deeper notch comes under the follower of the lever 133, and the drop of the lever 133 swings the lever 133—103 counter clockwise, and with it swings the lever 104 counter clockwise to bring the lower end into engagement with the pin 132 on the tail of lever 127, thereby preventing the lever from dropping, to engage another tooth on the ratchet wheel 117, even though the tail 131 of lever 127 would otherwise be free to move to engage another ratchet tooth to restore the totaling mechanism to accumulating position.

The auxiliary frame 72 (Figs. 8 and 12) has thereon a pivot member as shown to which is coupled a link 97 engaging with an upstanding lever 98 on the shaft 99 carried in bearings as shown on which there is also a depending lever 101 having a pin 102 thereon. This pin 102 is adjacent to the lever 106 on the lever 103 which cooperates with the upstanding end of the lever 104, the lower end of which cooperates with pin 132. As long as the slides 66 do not enter the drum 73, the link 97 is not moved by a sufficient amount to swing the pin 102 against the lever 106. Accordingly, the pin 132 is held down and with it the lever 127, which is prevented from moving to catch another ratchet tooth and return the totaling mechanism to accumulating position.

Therefore, the tabulator remains in totaling timing and totals are transferred repeatedly as

above described from the algebraic accumulator to the summation total accumulator. Each stroke of the tabulator thus transfers a total and each cycle causes a movement of the secondary frame 79 and an engagement of the pawl 77 with a tooth of the ratchet wheel 76 to move the drum 73 forward by one division. This continues until the slides 66 enter the drum, whereupon the link movement of the auxiliary frame 72 carries the link 97 a greater distance, rotates the levers 98—101 and shaft 99 by a greater amount to bring the pin 102 into engagement with the lever 106, rotating it clockwise and freeing the lever 104 for movement under the urge of the spring shown, whereby the tail of the lever is brought out of engagement with the pin 132, the lever 127 falls, engages another tooth on the ratchet 117 and restores the total control mechanism to the accumulating position, releasing the total link 163 and returning the tabulator mechanism to accumulating timing as previously described. This mechanism thus causes the repeated transfer of totals from the algebraic accumulator to the summation accumulator for a number of repetitions corresponding to the number of days in the interval between the dates on successive cards, that is, the number of days on which no transaction occurred.

Thereafter, the tabulation of the remainder of the transaction cards continues as above described, until the end of the transaction period is reached. When the last transaction card has been tabulated, the "last day" card is reached. This card carries the same date as the date upon the transaction cards for the last day of the period and its purpose is to prevent interference between the clearing control and any previous cards. In the event there is in fact a transaction card upon the last day of the month, this last day card has no particular function other than to produce an additional accumulation of zeros. In the event, however, that this card is the only card carrying the date of the last day of the month, it insures proper transfer of totals for all of the preceding days between it and the last transaction card. The zeros having been accumulated from the "last day" card, the clearing card is reached. Since this card carries a date one unit higher than the last day of the month, the change in dates is sensed by the designation mechanism and a total initiated as before described. However, this clearing card is punched for a sensing pin which will lift the wire 314 as shown in Fig. 31, and thereby rotate the lever 312 clockwise as shown in Fig. 29. The clockwise movement of lever 312 brings the pin 315 downward into engagement with the member 316 on the slide 301, thereby preventing movement of the slide to the left and preventing movement of the finger 302 into the path of the member 194. Accordingly, clearing of the algebraic accumulators is not prevented and they are thereby cleared as a corollary of the last transfer of amounts from the algebraic accumulator to the summation accumulator, thus preparing them for operation of the next depositor's cards. After the clearing card, there is provided a space card having a date thereon one unit higher than the clearing card, which again actuates the designation sensing mechanism and the total taking mechanism for the transfer of another total from the algebraic accumulators into the summation accumulators. However, since the algebraic accumulators have been cleared, only zeros are transferred, and this operation serves as the necessary spacing stroke for completing tens carrys in the summation accumulator.

Thereafter, the summation total card is sensed and a perforation therein allows a sensing pin 32 to lift an interponent 45 to actuate a wire 298 as shown in Figs. 25 and 31. Upward movement of wire 298 rotates the lever 297 in a clockwise direction, causing it, by engagement with pin 291 (Figs. 25, 26, 27 and 28) to pull the lever 289 downward into engagement with the latching member 296, whereupon rotation of the cam 294 forces the follower 293 towards the right carrying with it the lever 292 and pulling the lever 289 towards the right to rock the lever 288, the shaft 229 and the lever 278 counterclockwise to pull the link 277 to the left, and simultaneously, to disengage the zero stops as above described. Movement of the link 277 rocks the shaft 267 through the agency of the lever 276 as shown in Fig. 23. This movement of the shaft 267 moves the lever 271 and pushes the link 272 downward carrying the lever 273, the sleeve 264 and the lever 263 in a clockwise direction, thereby pulling the link 261 downward and engaging the notch in the lower side of the pitman 177 with the pin 257 on the lever 233. Thereupon, movement of the fan cam 179 coacting with the lever 259 rocks the shaft 178, pulls the lever 177 to the left and rotates the cam 176 to raise the shaft 175 and with it the gears 174 into engagement with the rack sector 171. Thereafter, the bails, as shown in Fig. 16, free the sectors and they rotate until stopped by the spurs upon the wheels 174. Thereafter, printing occurs in the normal fashion to record the balance summation.

When the summation total is initiated by the elevation of wire 298, the wire 298*a* joined thereto is raised, to set an appropriate stop 178 to position a type for printing the character "T". Upon the return movement of the fan cam 179, the link 177 is pushed to the right, causing the disengagement of the wheel 174 from the racks 171 in cleared, zero, position in preparation for the summation of the amounts of the next customer's balance.

It is not necessary to stop the tabulator between summations of successive accounts, but the groups of transaction cards of the successive customers, each accompanied by the special cards, may be put into the tabulator card magazine successively, each group on top of the preceeding one, and the tabulation and summations continued until all of the customers' accounts have been tabulated and summarized.

By the system and device of this invention there is thus provided a new and convenient system and mechanism for summarizing day balances from a series of transactions.

While there is above described but a single embodiment of the invention, it is possible to produce still other embodiments without departure from the inventive concept above disclosed, and it is, therefore, desired that only such limitations shall be imposed on the appended claims as are stated therein, or required by the prior art.

What I claim as new, and desire to secure by Letters Patent, is:

1. In a machine of the class described, the combination of an accumulator, a plurality of sets of actuating racks for said accumulator, means for causing the engagement and disengagement of said accumulator and either of said sets of actuating racks, said last recited means including a first resilient means arranged to disengage the accumulator from either of said sets of racks and

a second resilient means arranged to engage said accumulator with either of said sets of racks against the tension of said first resilient means, means to render said second resilient means ineffective whereby said first resilient means may become effective, and means operable to retain said accumulator in engagement with either of said sets of racks against the tension of said first resilient means when said second resilient means is rendered ineffective.

2. In a machine of the class described, the combination of an accumulator, a plurality of sets of actuating racks for said accumulator, and means for causing the engagement and disengagement of said accumulator and either of said sets of actuating racks during each cycle of machine operation, said last recited means including a first resilient means arranged to disengage the accumulator from either of said sets of racks during each cycle of operation, a second resilient means arranged to engage said accumulator with either of said sets of racks against the tension of said first resilient means during each cycle of operation, means to render said second resilient means ineffective during a portion of each cycle of operation, and means operative during certain cycles of operation to retain said accumulator in engagement with either of said sets of racks against the tension of said first resilient means.

3. In a machine of the class described, the combination of an accumulator, a plurality of sets of actuating racks for said accumulator, and means for causing the engagement and disengagement of said accumulator and either of said sets of actuating racks during each cycle of machine operation, said last recited means including a first resilient means arranged to disengage the accumulator from either of said sets of racks during each cycle of operation, a second resilient means arranged to engage the accumulator with either of said sets of racks against the tension of said first resilient means during each cycle of operation, means to render said second resilient means ineffective during a portion of each cycle of operation, and means operative during a total taking cycle to retain said accumulator in engagement with either of said sets of racks against the tension of said first resilient means, said last recited means comprising a blocking member movable into the path of members carrying said accumulator, a frame for carrying said blocking member, a lever mechanism for moving said frame, and connections between said lever mechanism and a total shaft.

WILLIAM W. LASKER.

CERTIFICATE OF CORRECTION.

Patent No. 2,140,136. December 13, 1938.

WILLIAM W. LASKER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 40, for the patent number "1,476,555" read 1,376,555; page 9, first column, line 16, for the word "filed" read field; and second column, line 53, for "arm 28" read arm 228; page 17, first column, line 20, for "therein to" read therein into; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of December, A. D. 1939.

Henry Van Arsdale,

(Seal) Acting Commissioner of Patents.