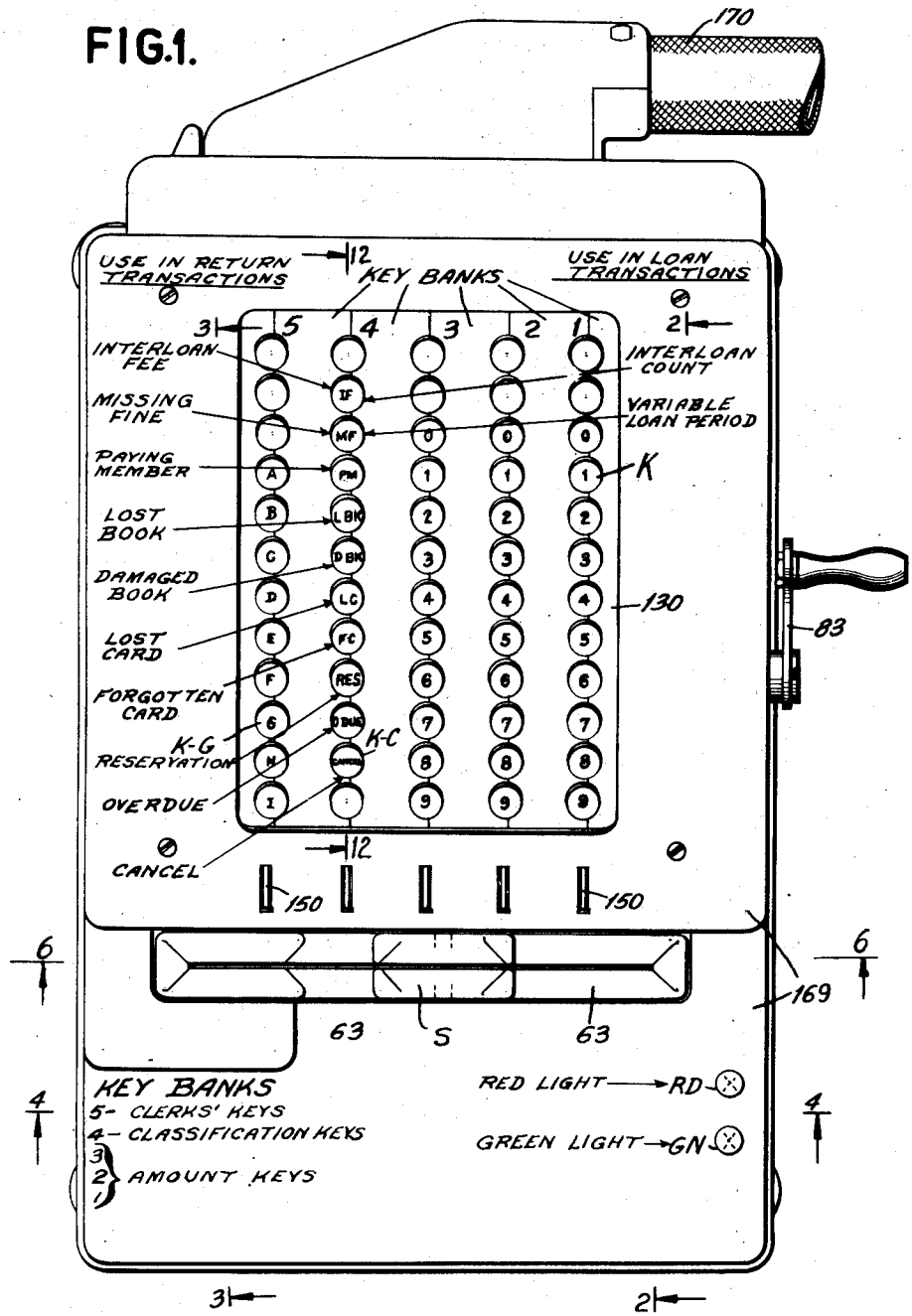
Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG.1.



INVENTORS
Albert W. Mills
Edward J. Rabenda
Frank J. Fuyman
Edward J. Stengle

BY

ATTORNEY.

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RECORDING MACHINE

Filed Dec. 24, 1942 24 Sheets-Sheet 2

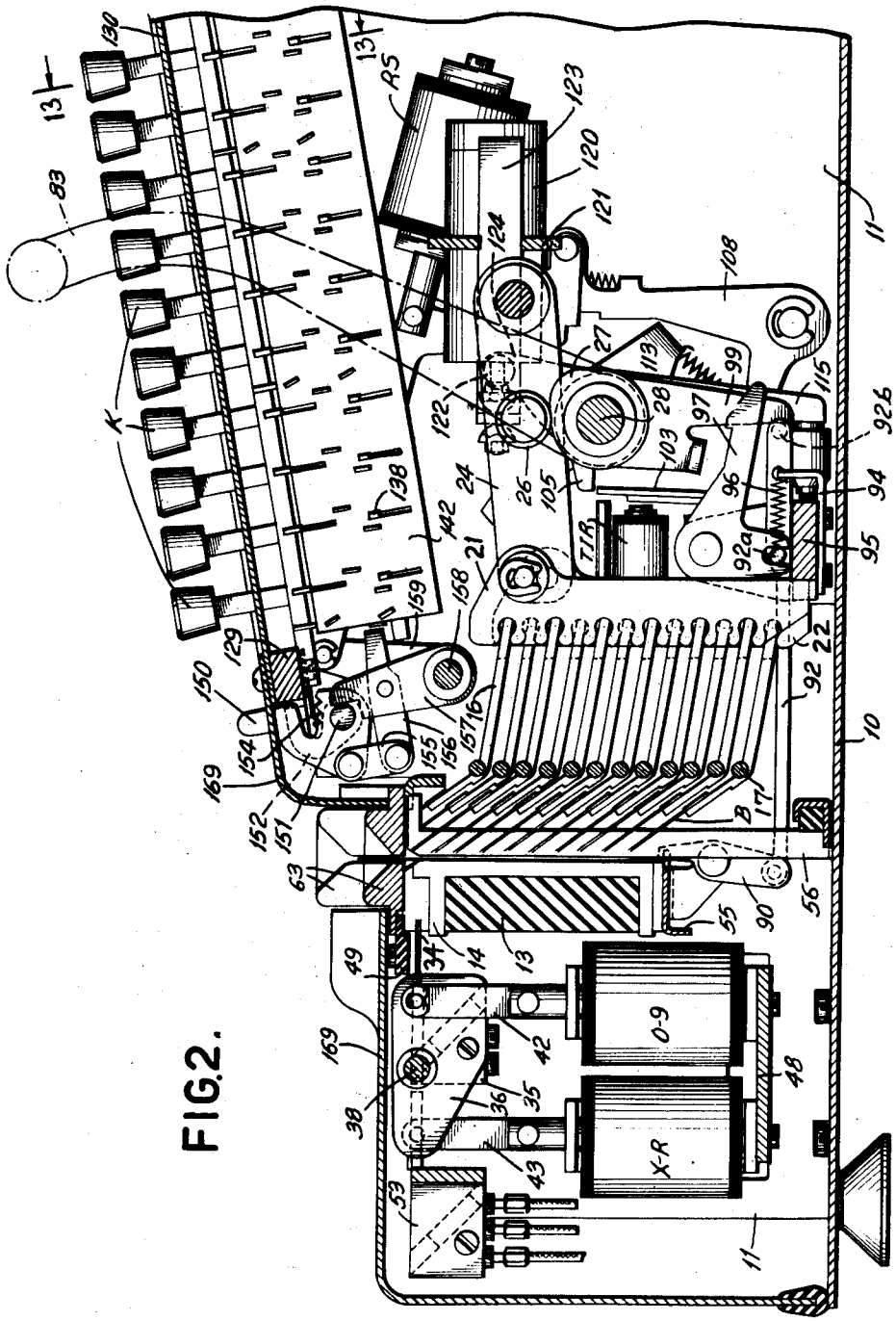


FIG.2.

INVENTORS
Albert W. Mills
Edward J. Nichols
Frank E. Tyrman
Edward J. Stroup

BY

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RECORDING MACHINE

Filed Dec. 24, 1942 24 Sheets-Sheet 3

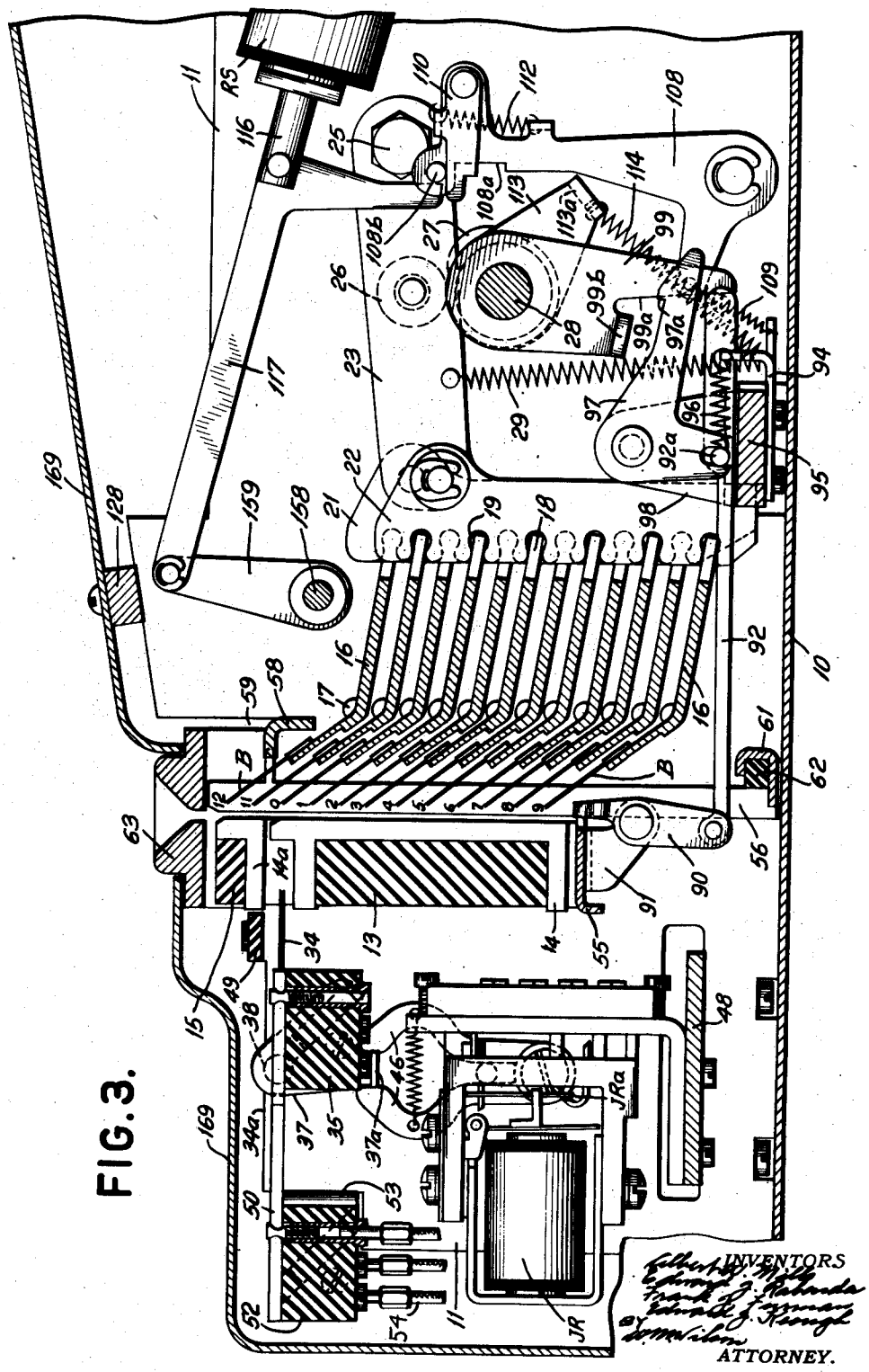


FIG. 3.

INVENTORS

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RECORDING MACHINE

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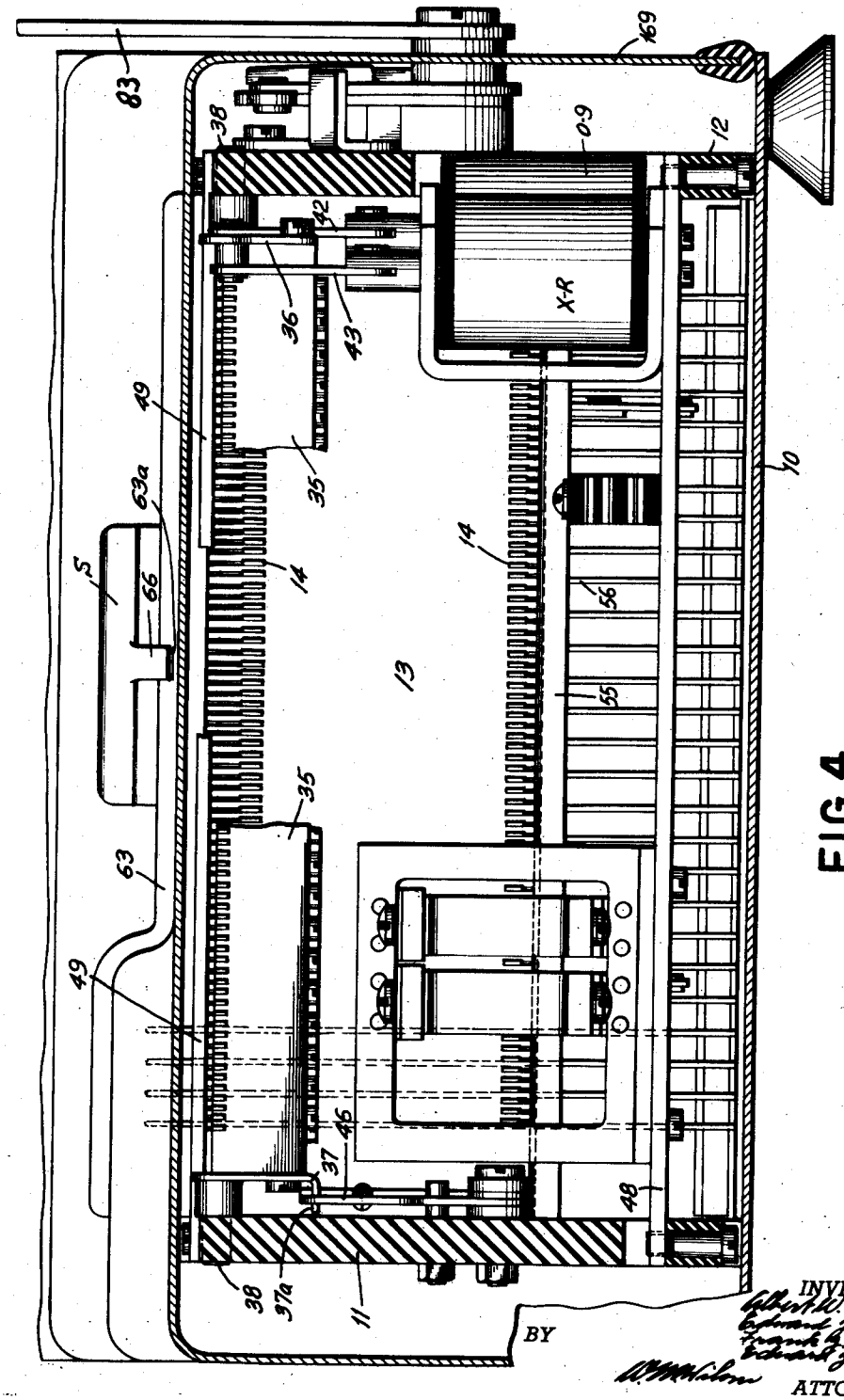


FIG. 4.

INVENTORS
Albert W. Mills
Edward J. Palanda
Frank G. Foreman
Edward J. Keough
BY
ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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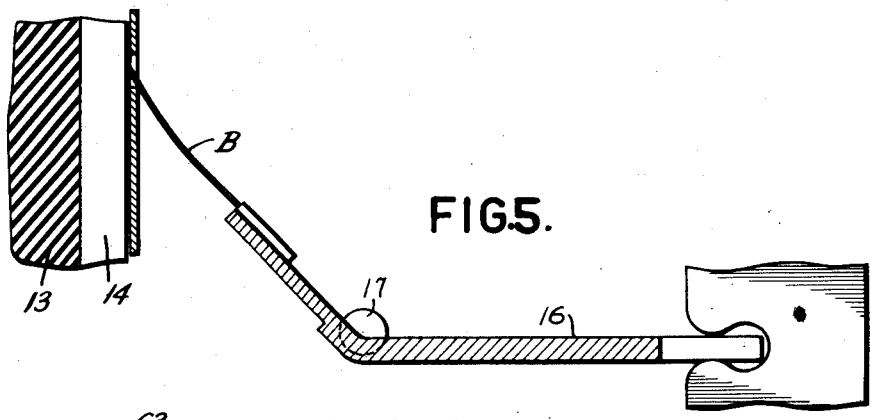


FIG.5.

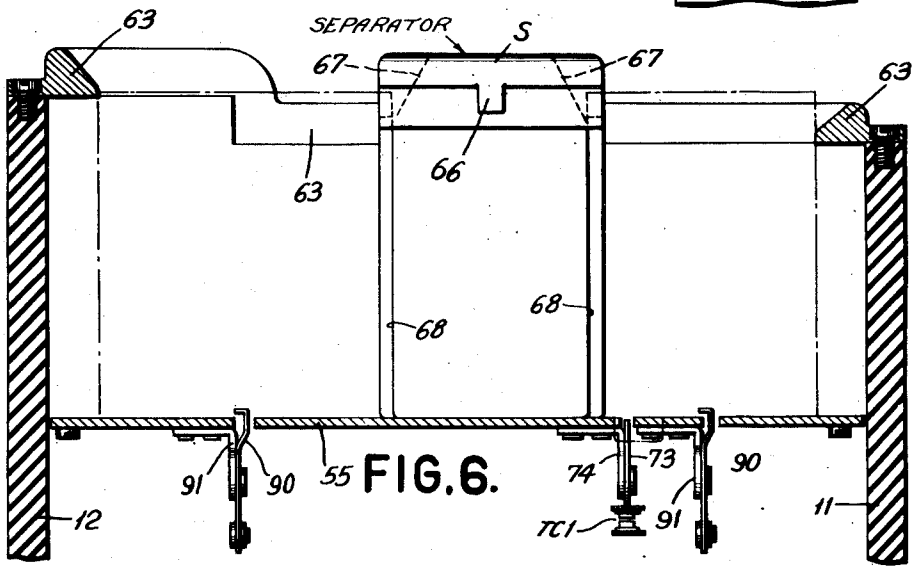


FIG.6.

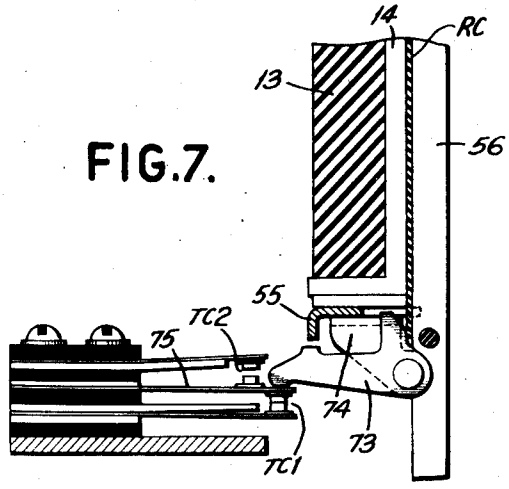


FIG.7.

RETURN CHECK CARD-RC

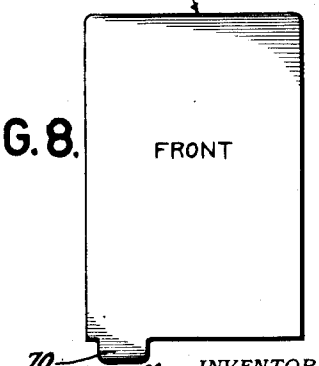


FIG.8.

INVENTORS
Albert W. Mills
Edward J. Kabunde
Frank E. Fuhrman
Edward J. Kanzler

BY W. M. Mahon ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG.9.

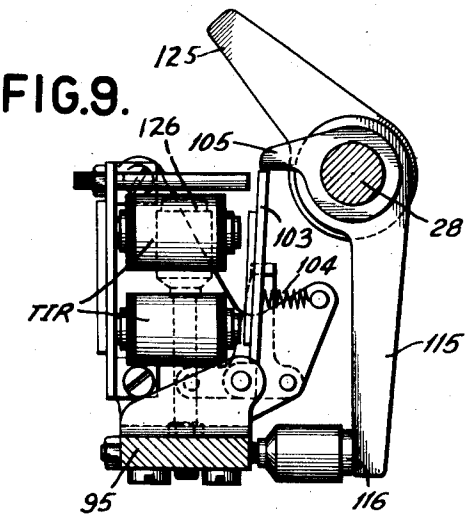


FIG.10.

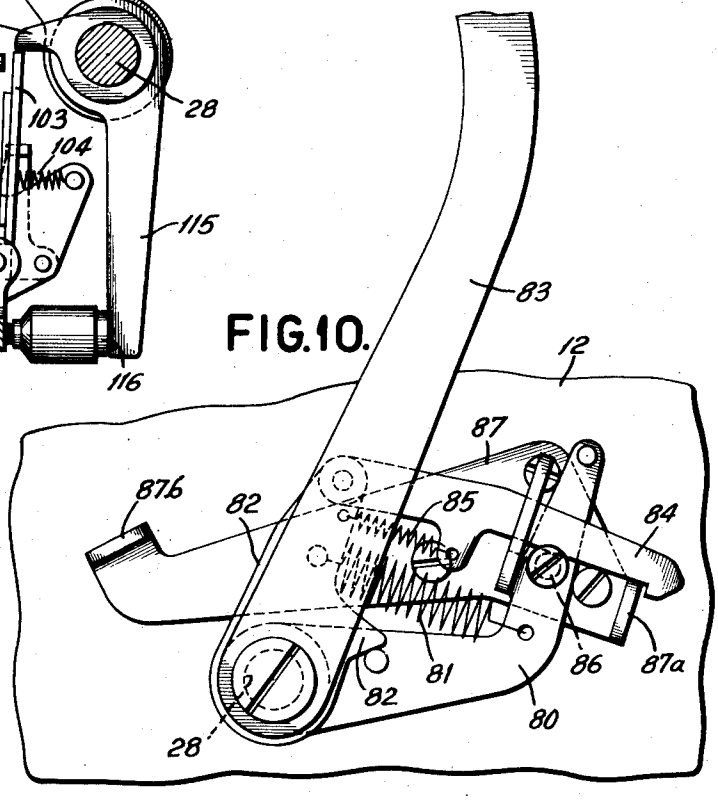
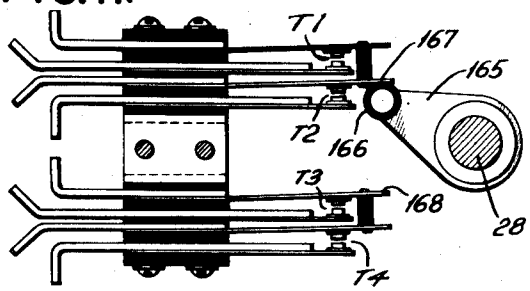


FIG.11.



INVENTORS

Albert W. Mills
Edward J. Palenda
Frank J. Fitzmaurice
Edward J. Stange

BY W. M. Wilson ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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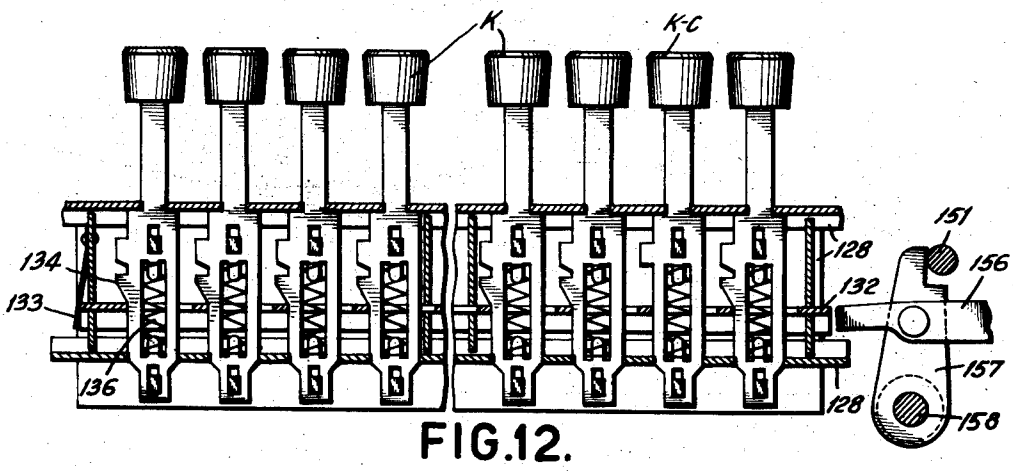


FIG.12.

FIG.13.

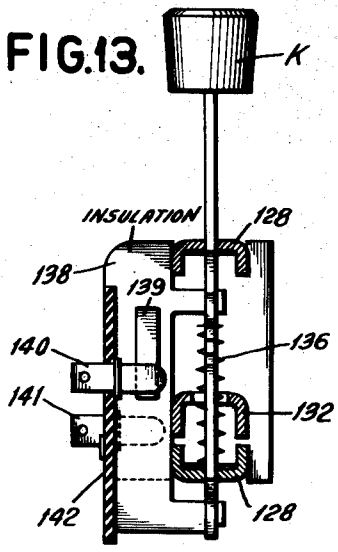
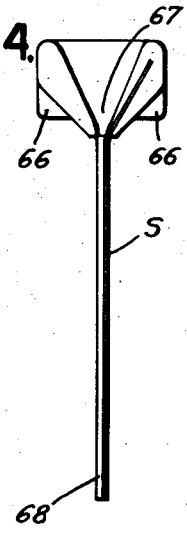


FIG.14.



BY

INVENTORS
Albert W. Mills
Edmund J. Malinda
Frank J. Zimmerman
Edmund J. Krenzke
W. M. Wilson ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG.15.

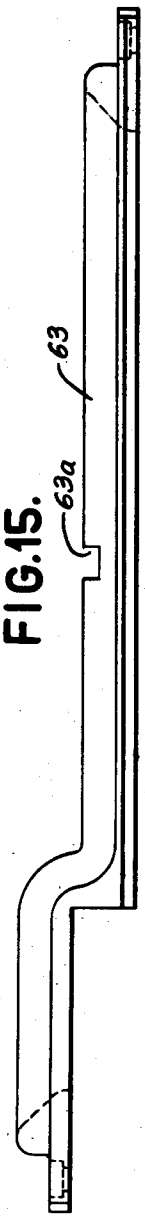


FIG.16.

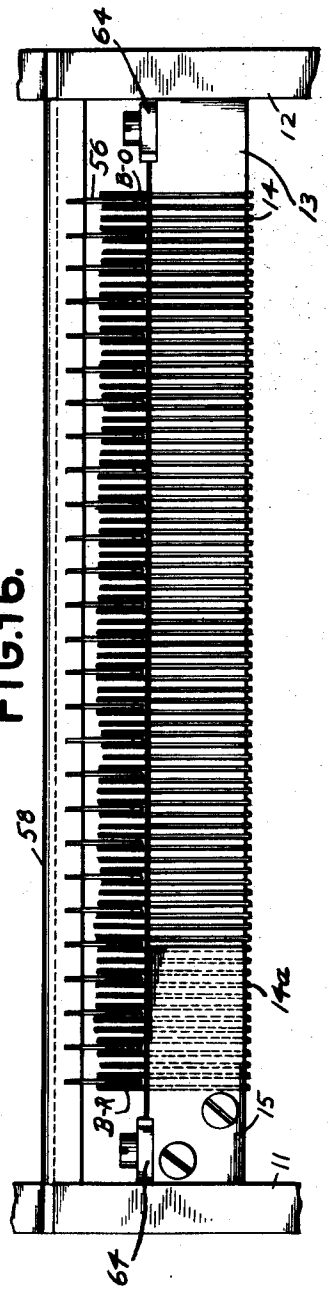
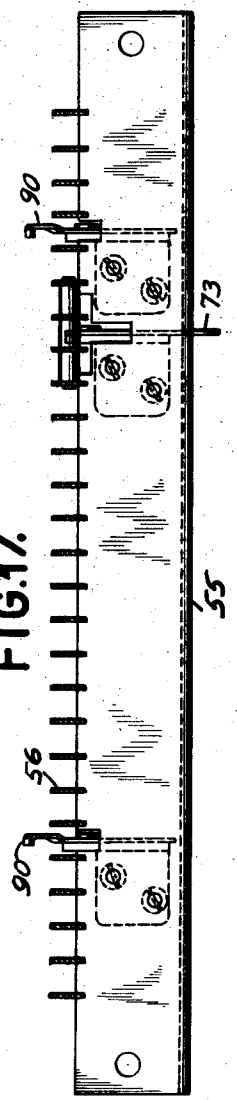


FIG.17.



INVENTORS

Albert W. Mills
Edward J. Kalmus
Frank A. Fennema
Edward J. Keogh

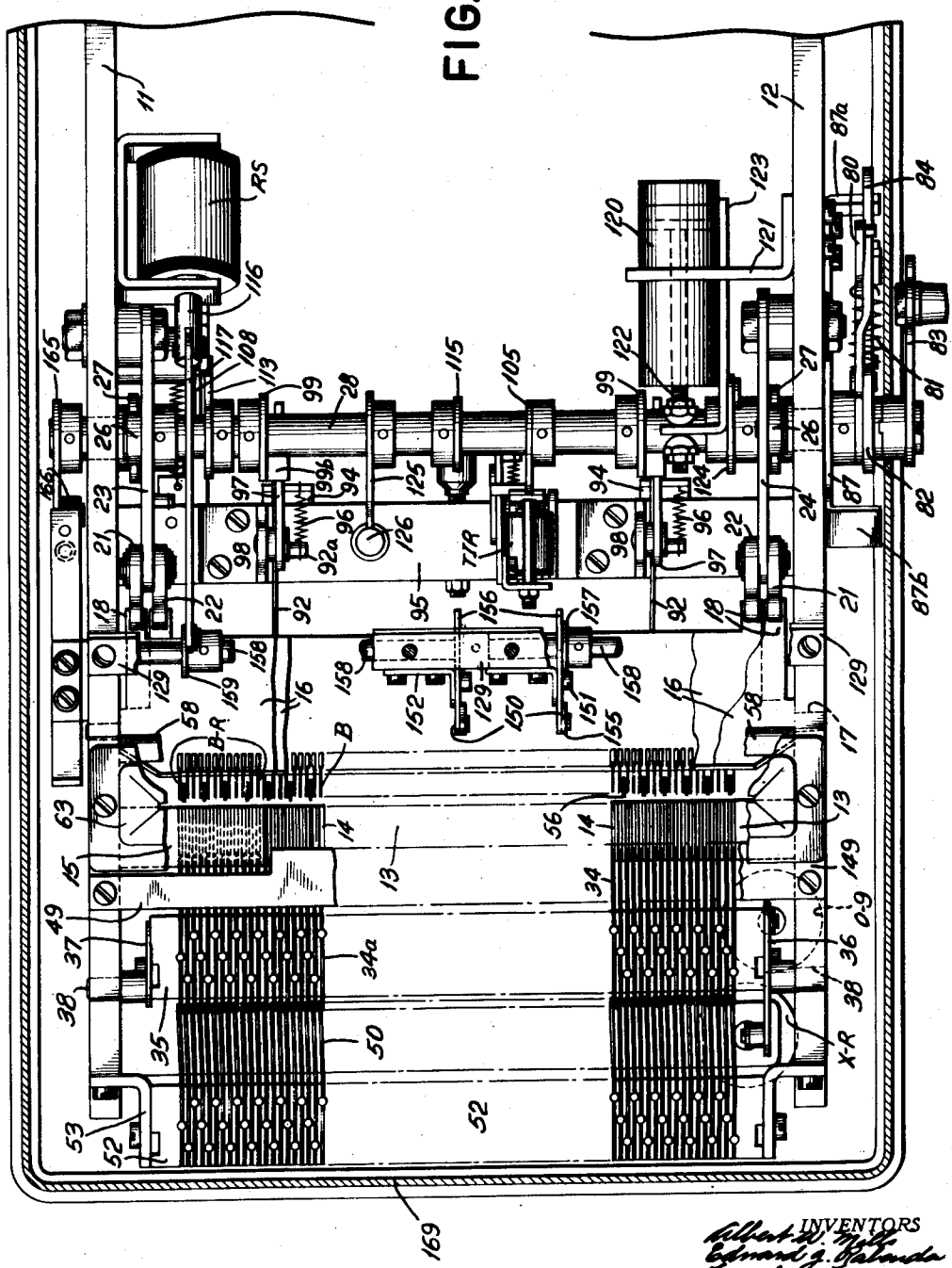
BY W. M. Watson ATTORNEY

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG.18.



INVENTORS
Albert W. Mills
Edmund G. Rabenda
Frank G. Freeman
Edmund J. Krengel

BY W. W. Wilson ATTORNEY.

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RECORDING MACHINE

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FIG. 20.

CARD T PUNCHED ONLY WITH RETURN DATA

FIG. 19.

CARD T PUNCHED WITH LOAN DATA ONLY

FIG. 21.

MONTH CODE

CARD COLS.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
32	X				X			X	X		X	X
33		X			X	X				X	X	
34			X			X	X	X				X
35				X			X		X	X	X	X

INVENTORS
Albert W. Mills
Ignatz J. Kalanda
Frank L. Freeman
Edward J. Kenyon

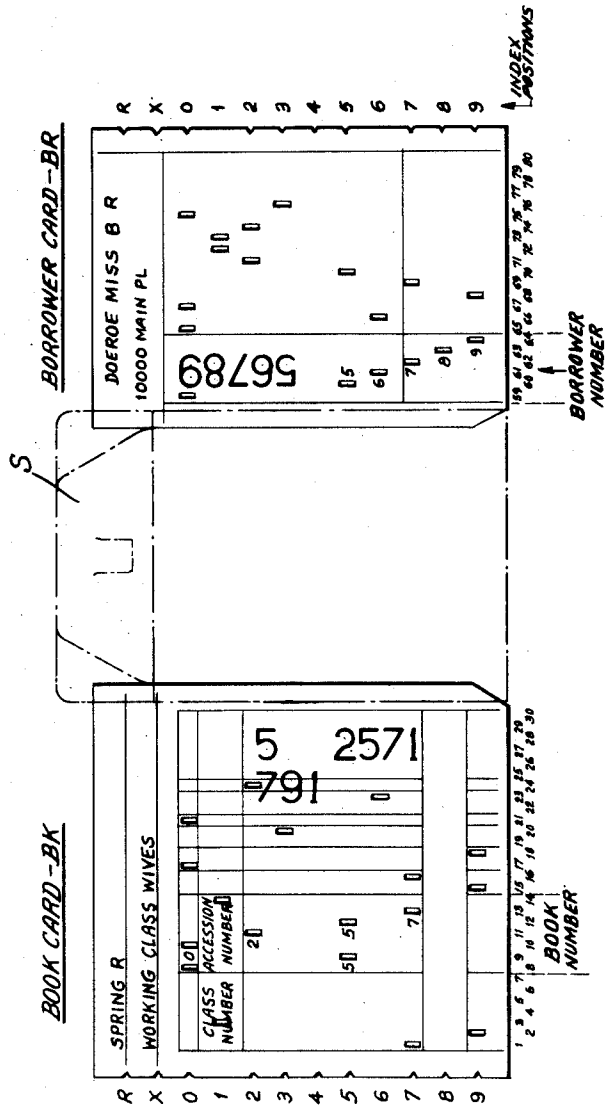
BY W. W. Wilson ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG.22.



INVENTORS
Albert W. Mills
Edmund J. Belonde
Frank J. Fuqua
Edward J. Krenz

BY

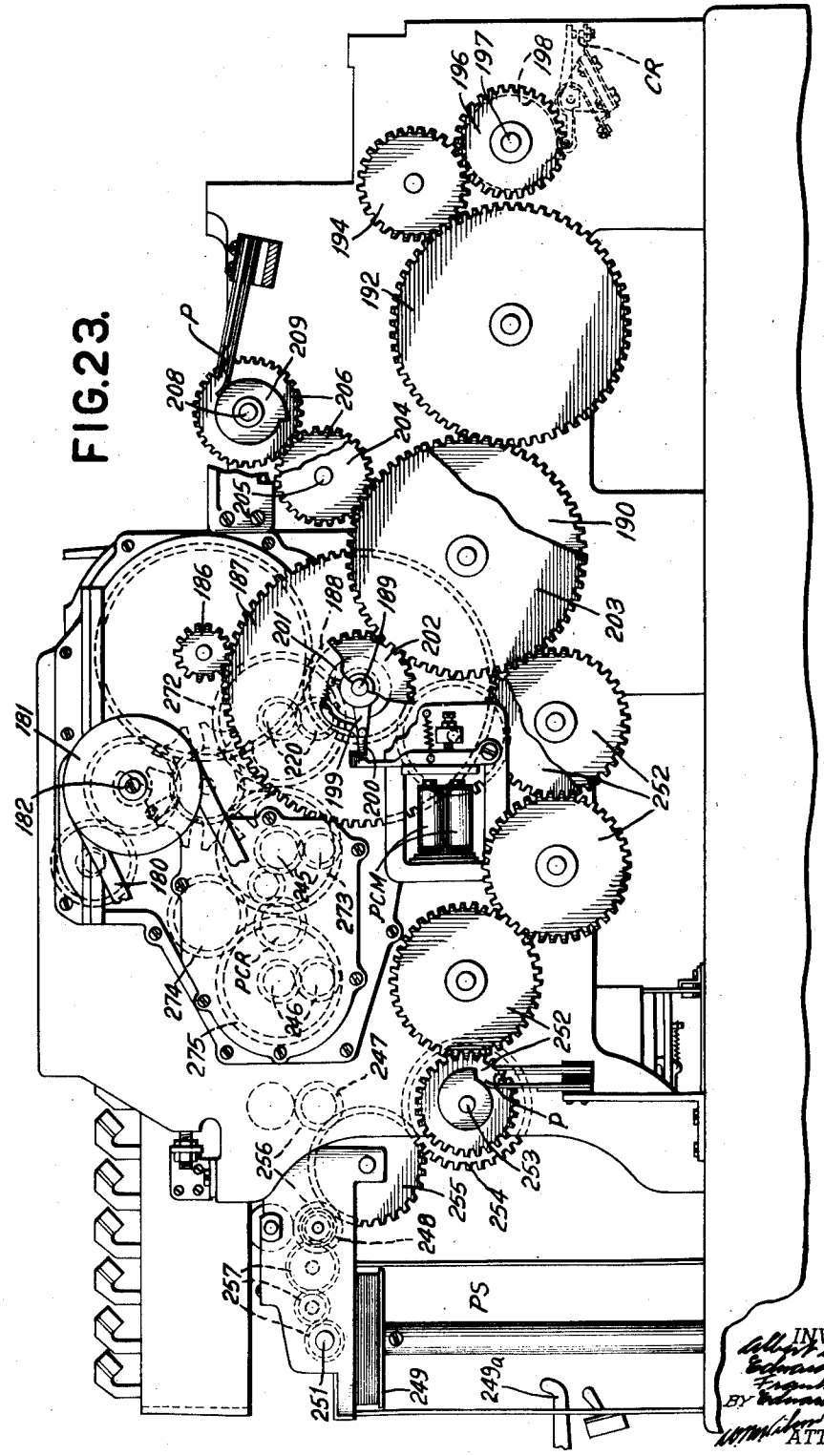
ATTORNEY.

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RECORDING MACHINE

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FIG.23.



INVENTORS
Albert W. Mills
Edward J. Rakunas
Frank J. Furman
BY Edward J. Kemp
ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG.25.

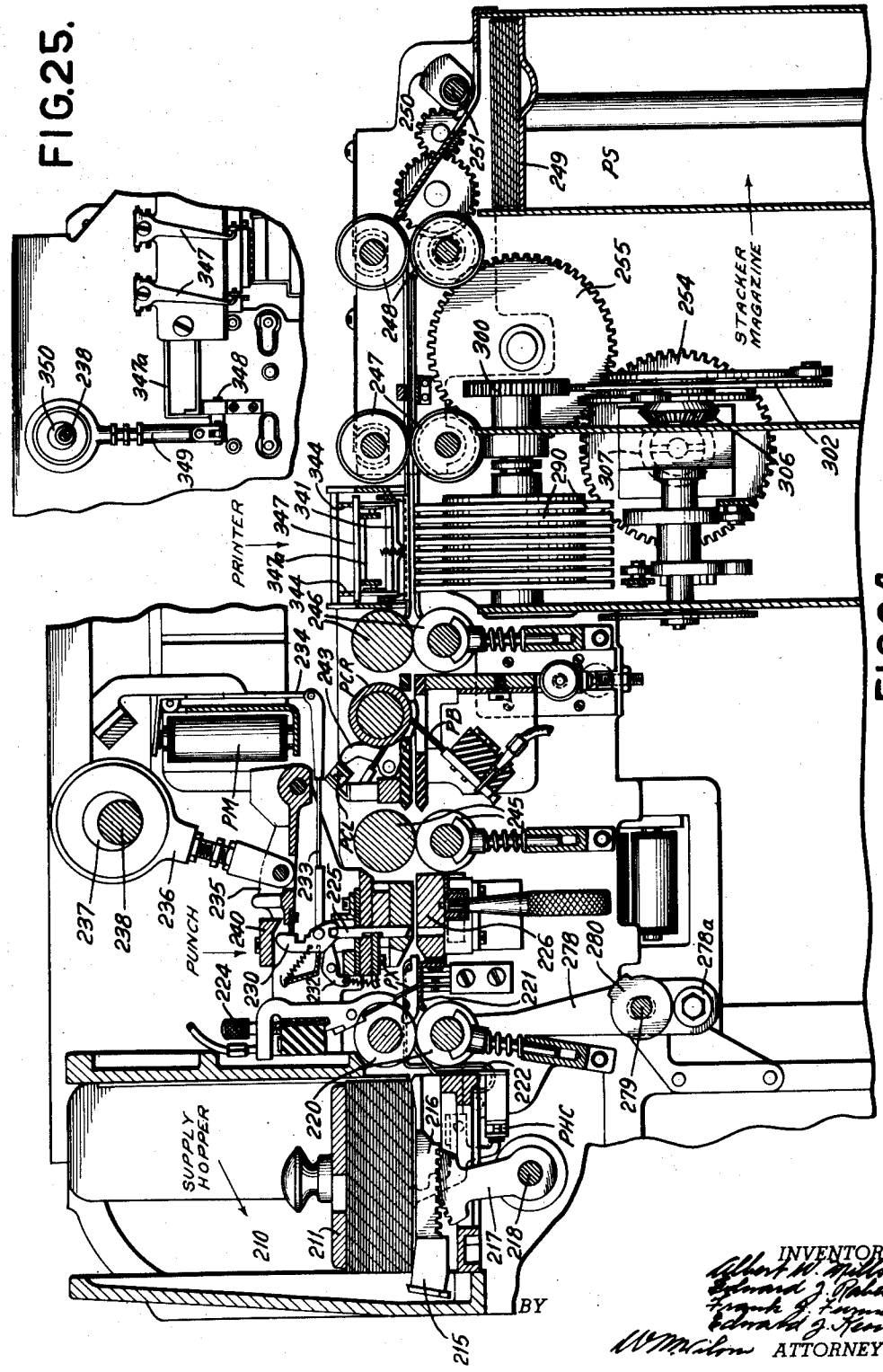


FIG.24.

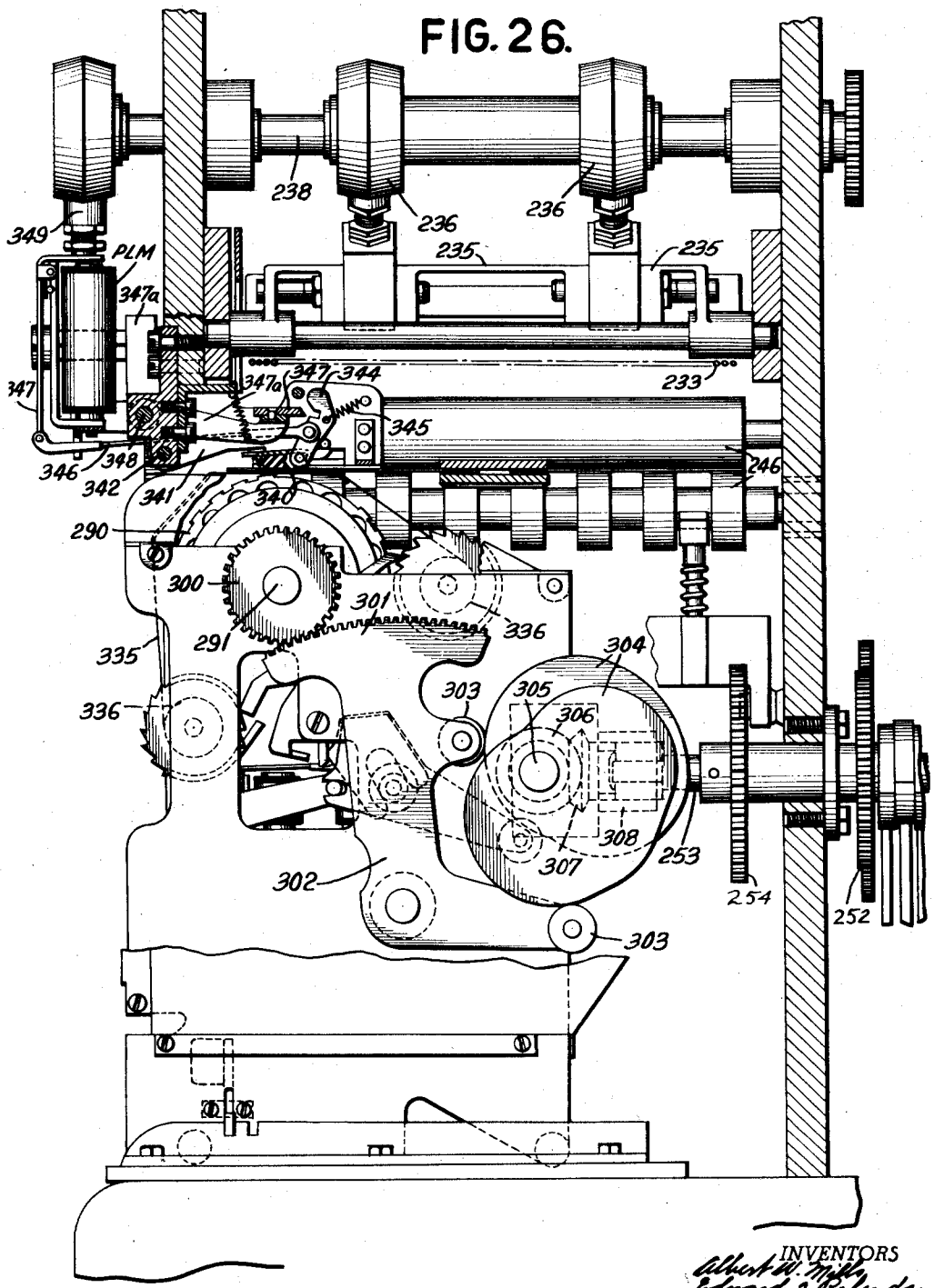
INVENTORS
Albert W. Mills
Edward J. Rabenda
Frank A. Freeman
Edward J. Fenaughty
BY
W. W. Mills ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG. 26.



INVENTORS
Albert W. Mills
Edward J. Palenda
Frank L. Furman
Edward J. Keough

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ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG. 27.

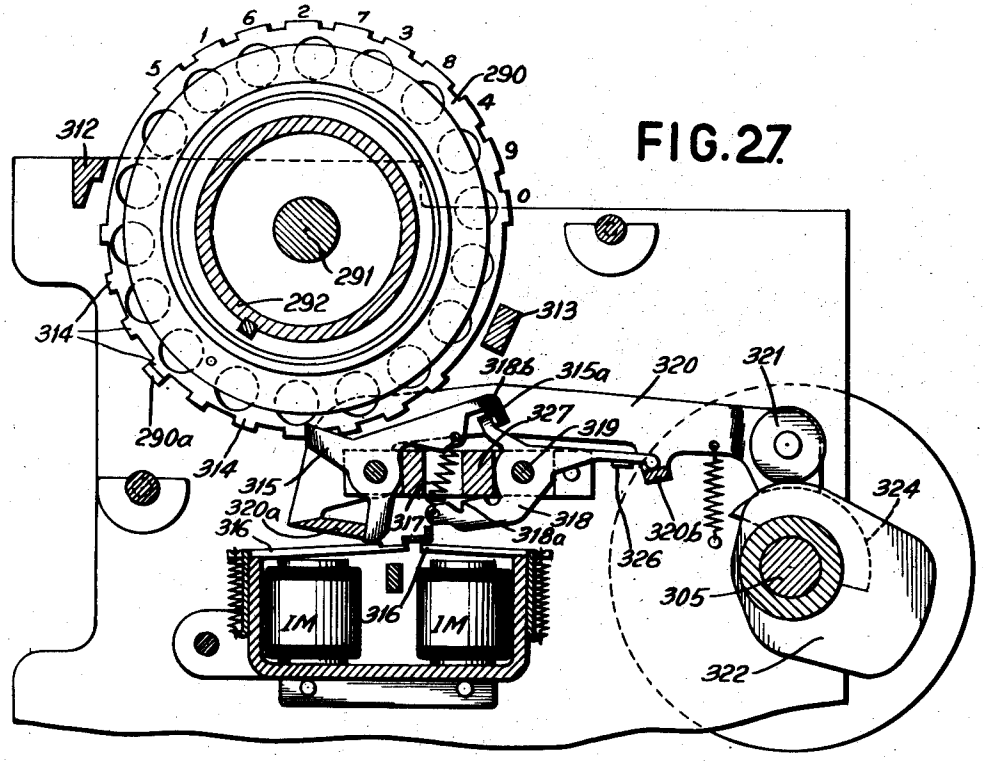


FIG. 28.

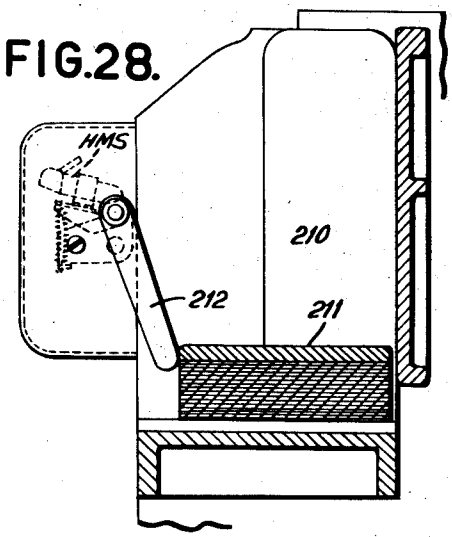
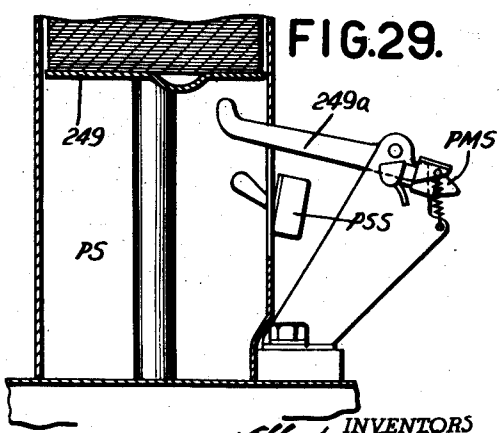


FIG. 29.



INVENTORS
Albert W. Mills
Edward J. Rabenda
Frank G. Fuhrman
Edward J. Stengle

BY W. M. Wilson ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG. 30.

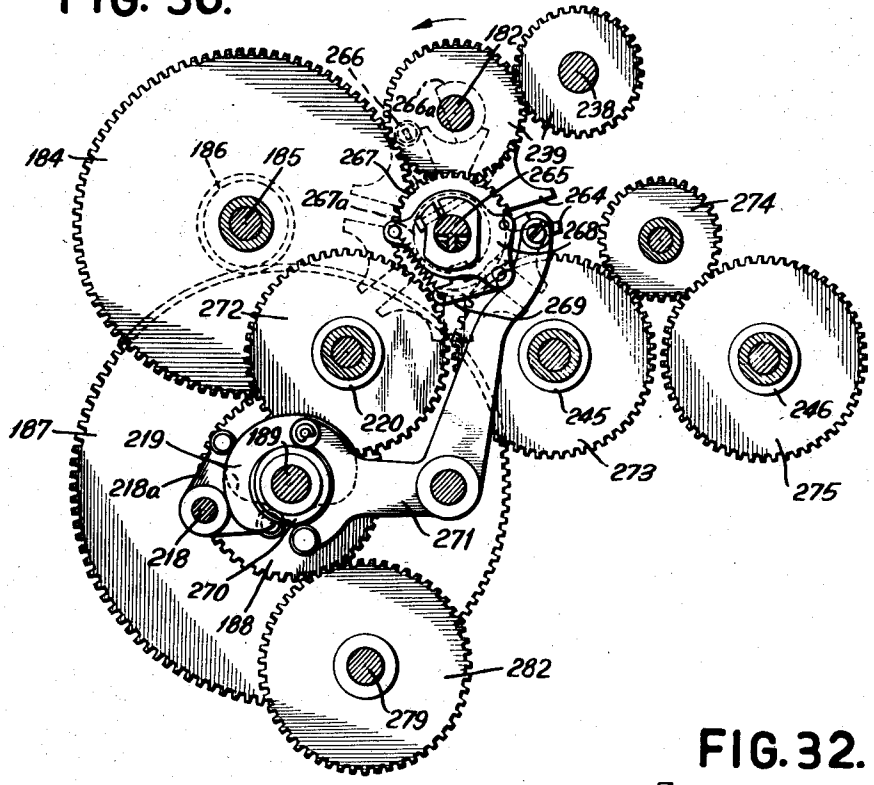


FIG. 31.

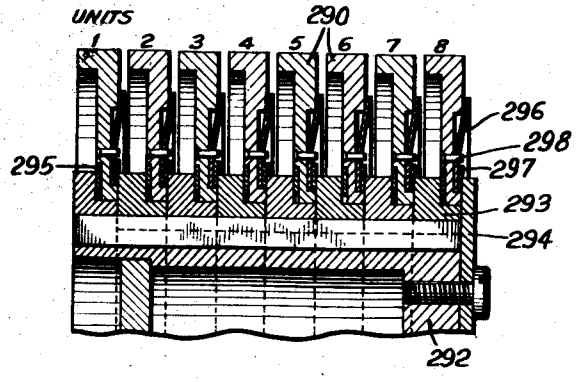
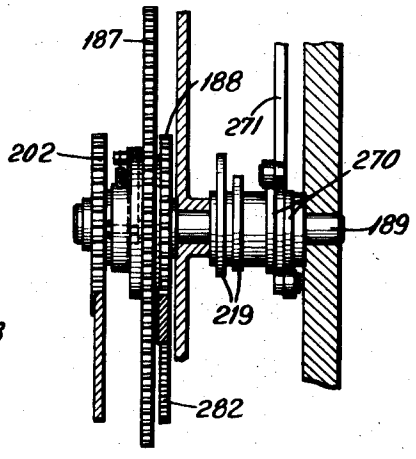


FIG. 32.



INVENTORS
Albert W. Mills
Edward J. Kleinschmidt
Frank J. Tinman
Edward J. Kleinschmidt

BY

ATTORNEY.

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RECORDING MACHINE

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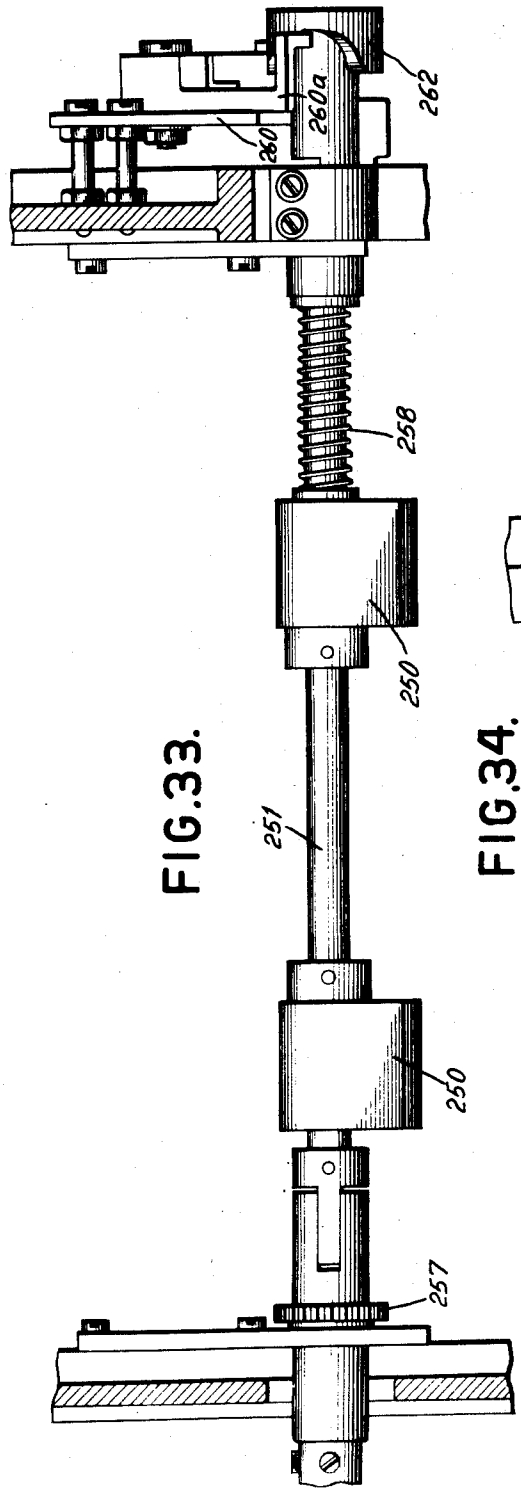


FIG. 33.

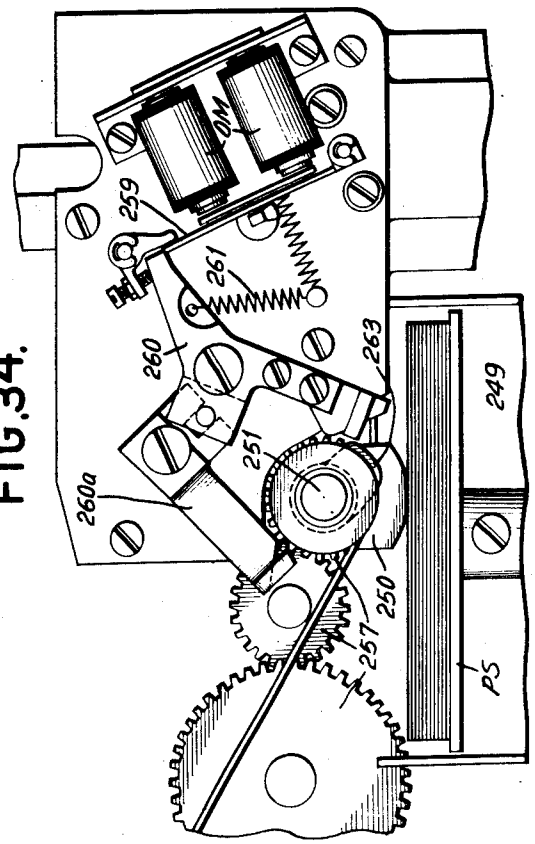


FIG. 34.

INVENTORS
Albert W. Mills
Edward J. Rolanda
Frank L. Furman
Edward J. Keough

BY W. M. Wilson ATTORNEY.

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

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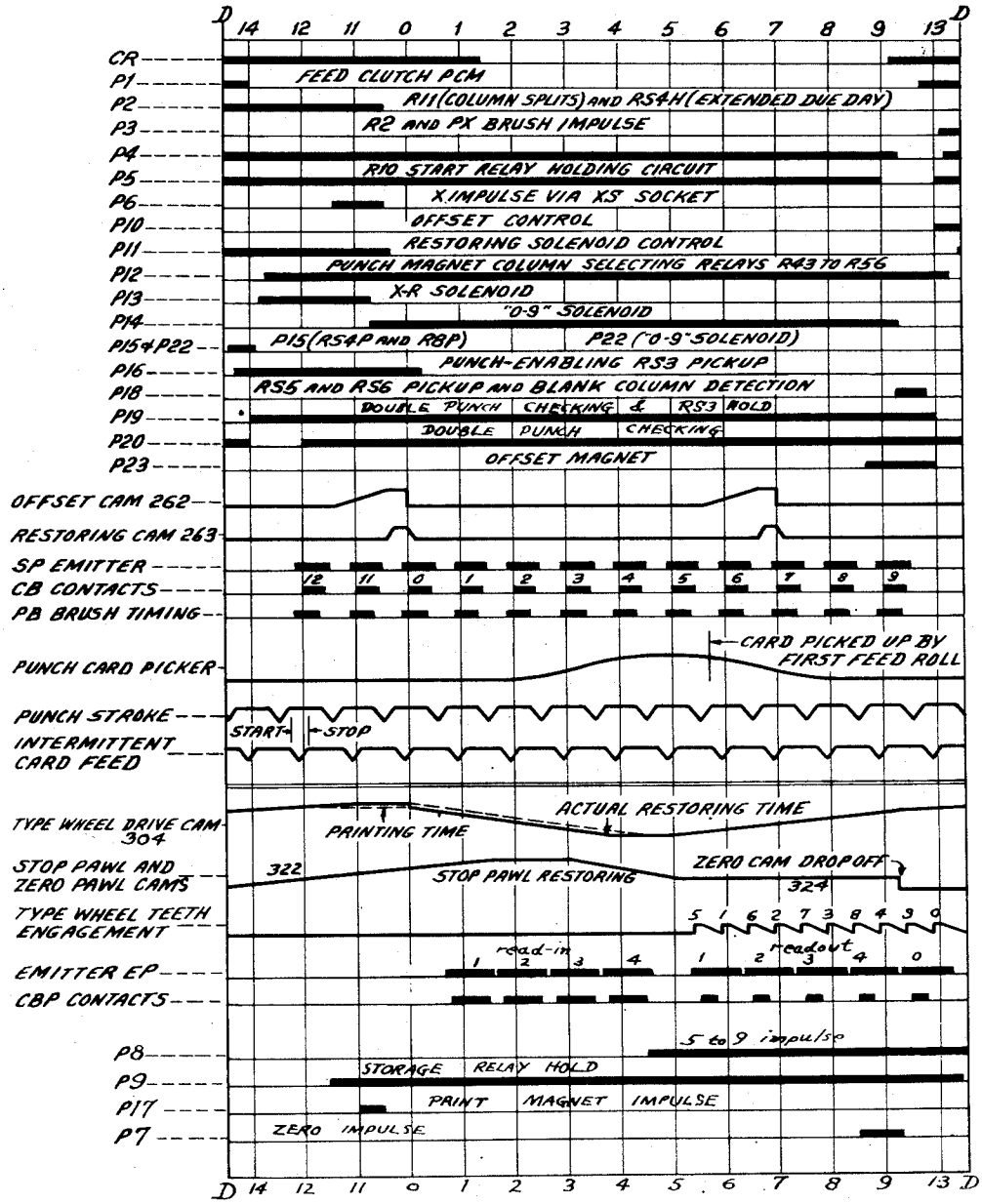


FIG. 35.

INVENTORS
Albert W. Mills
Edward J. Rabenda
Frank J. Fuzman
Edward J. Stroup

BY W. M. Wilson ATTORNEY

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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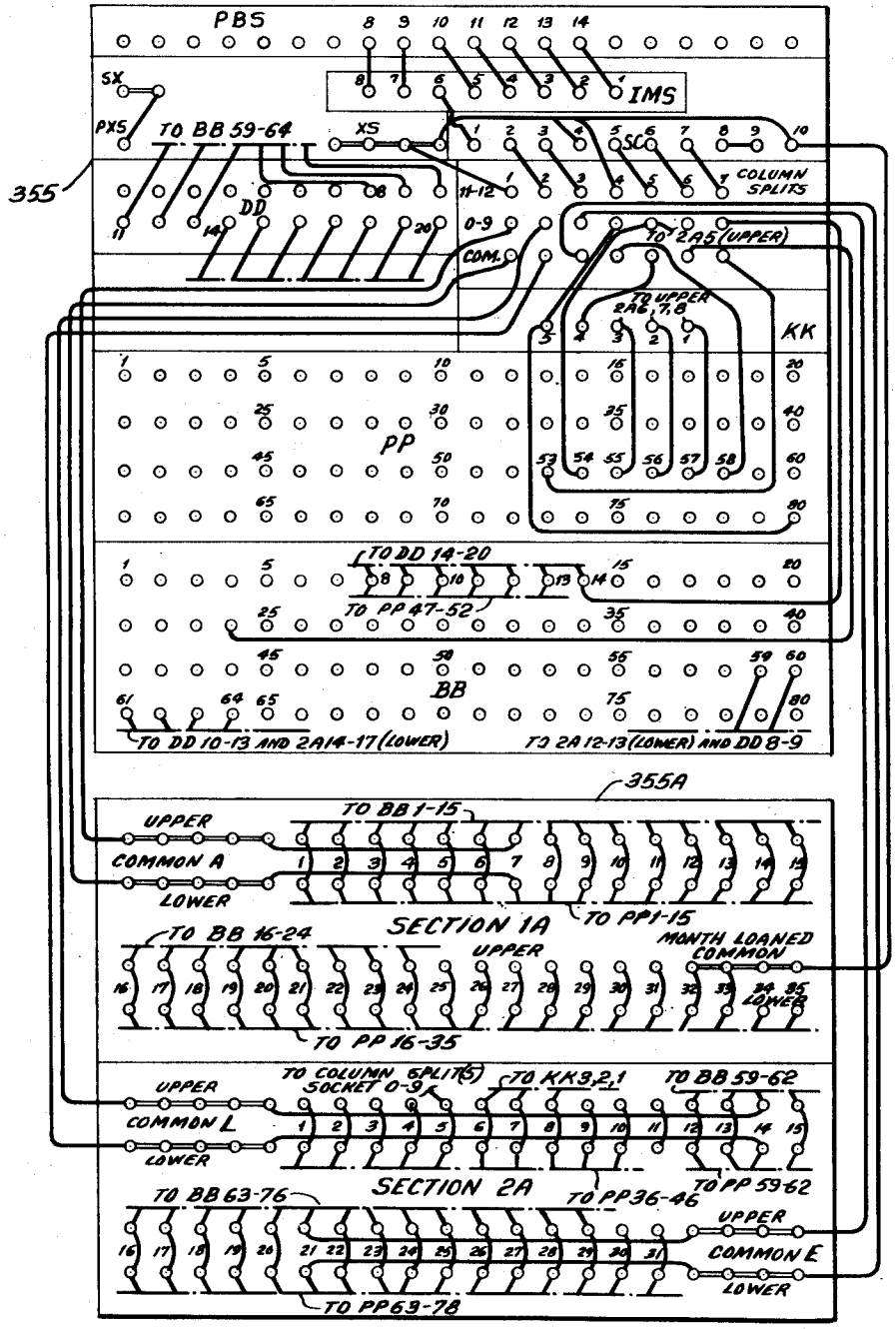


FIG. 36.

INVENTORS
Albert W. Mills
Edward J. Rolinski
Frank G. Freeman
Edward J. Stough

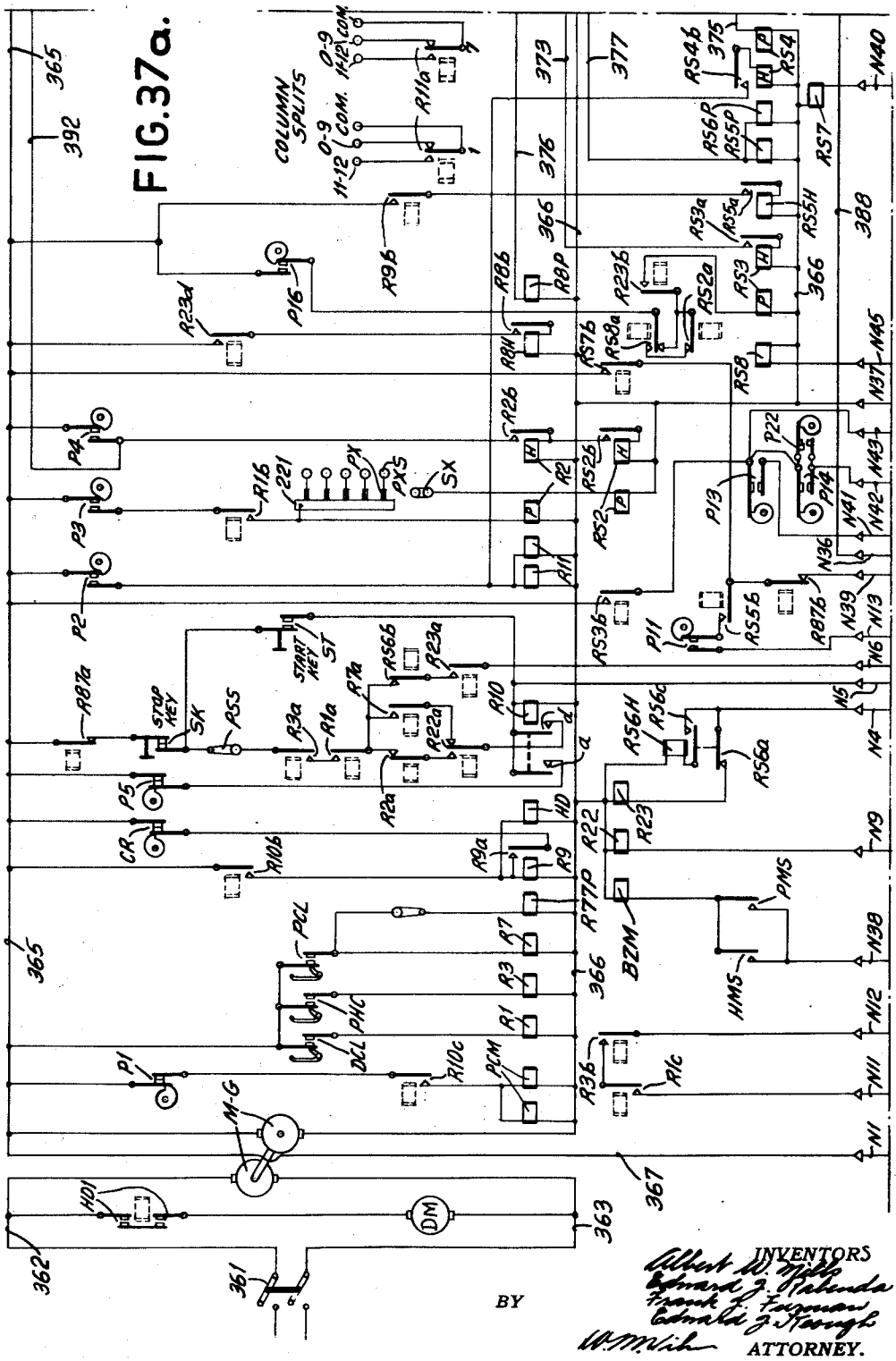
BY W. Marlow ATTORNEY

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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FIG. 37a.



Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

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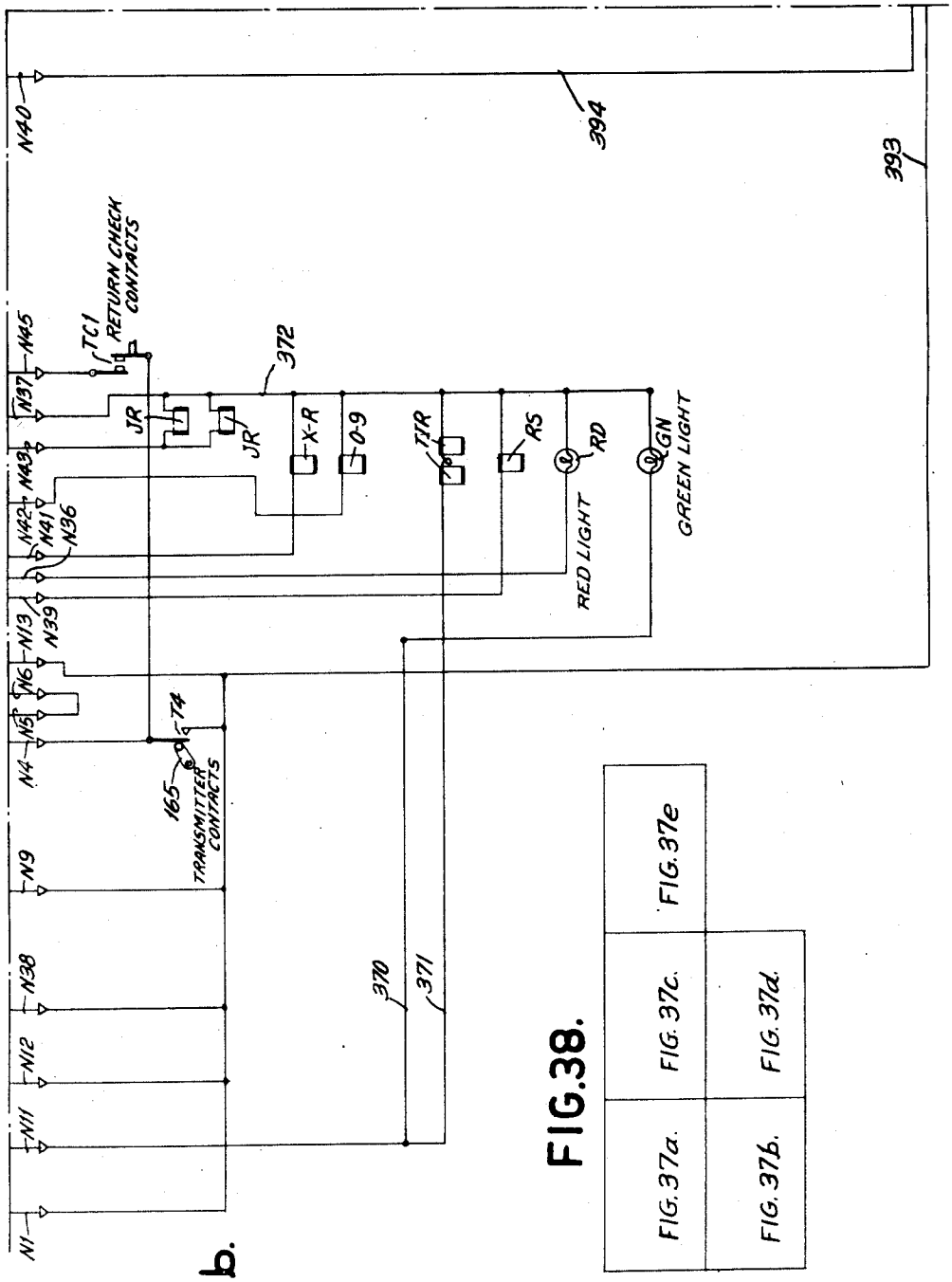


FIG. 37b.

FIG. 38.

FIG. 37a.	FIG. 37c.	FIG. 37e
FIG. 37b.	FIG. 37d.	

INVENTORS
Albert W. Mills
Edward J. Takenda
Frank J. Furman
Edward J. Keough

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ATTORNEY

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

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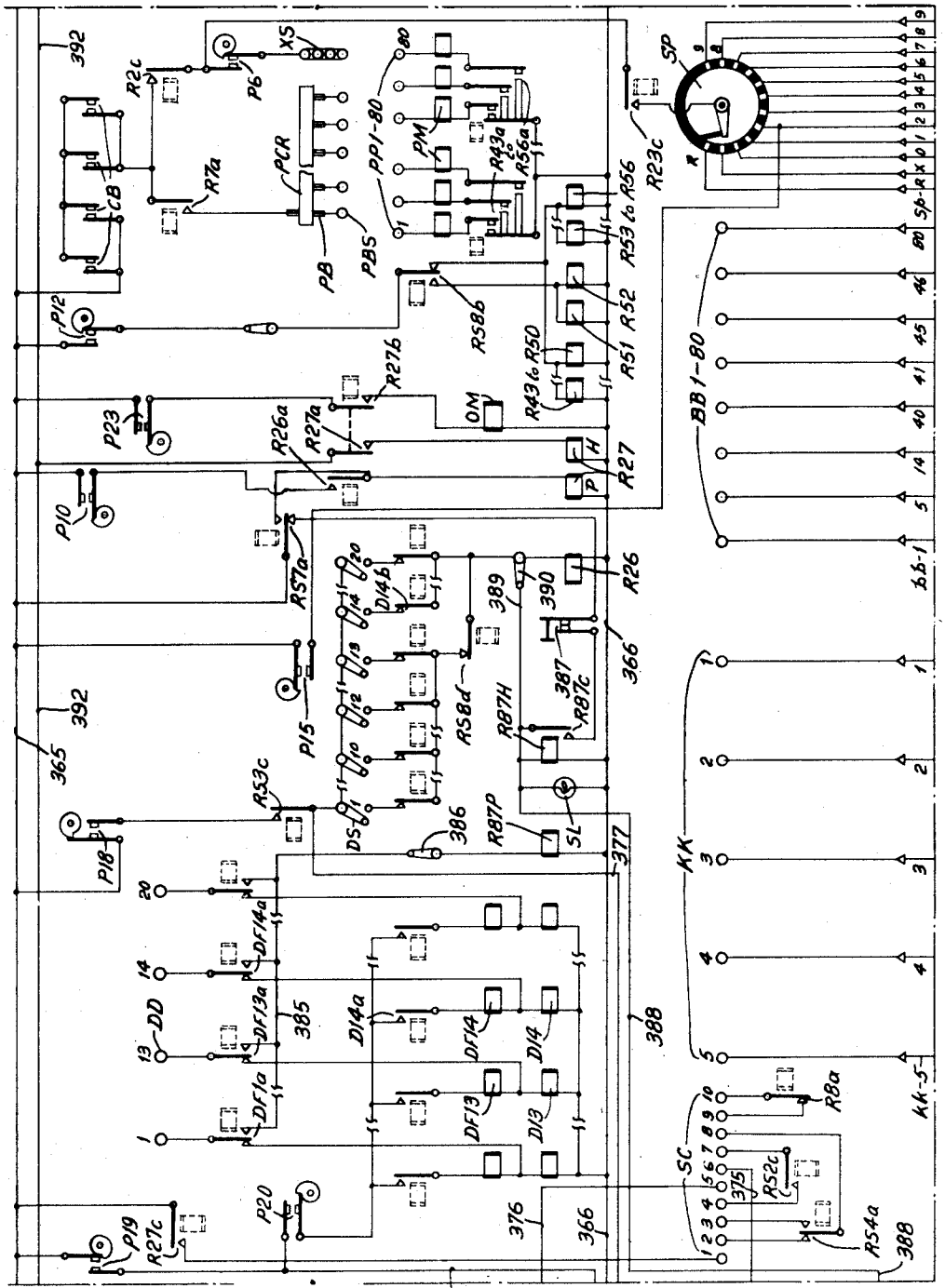


FIG.37c.

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RECORDING MACHINE

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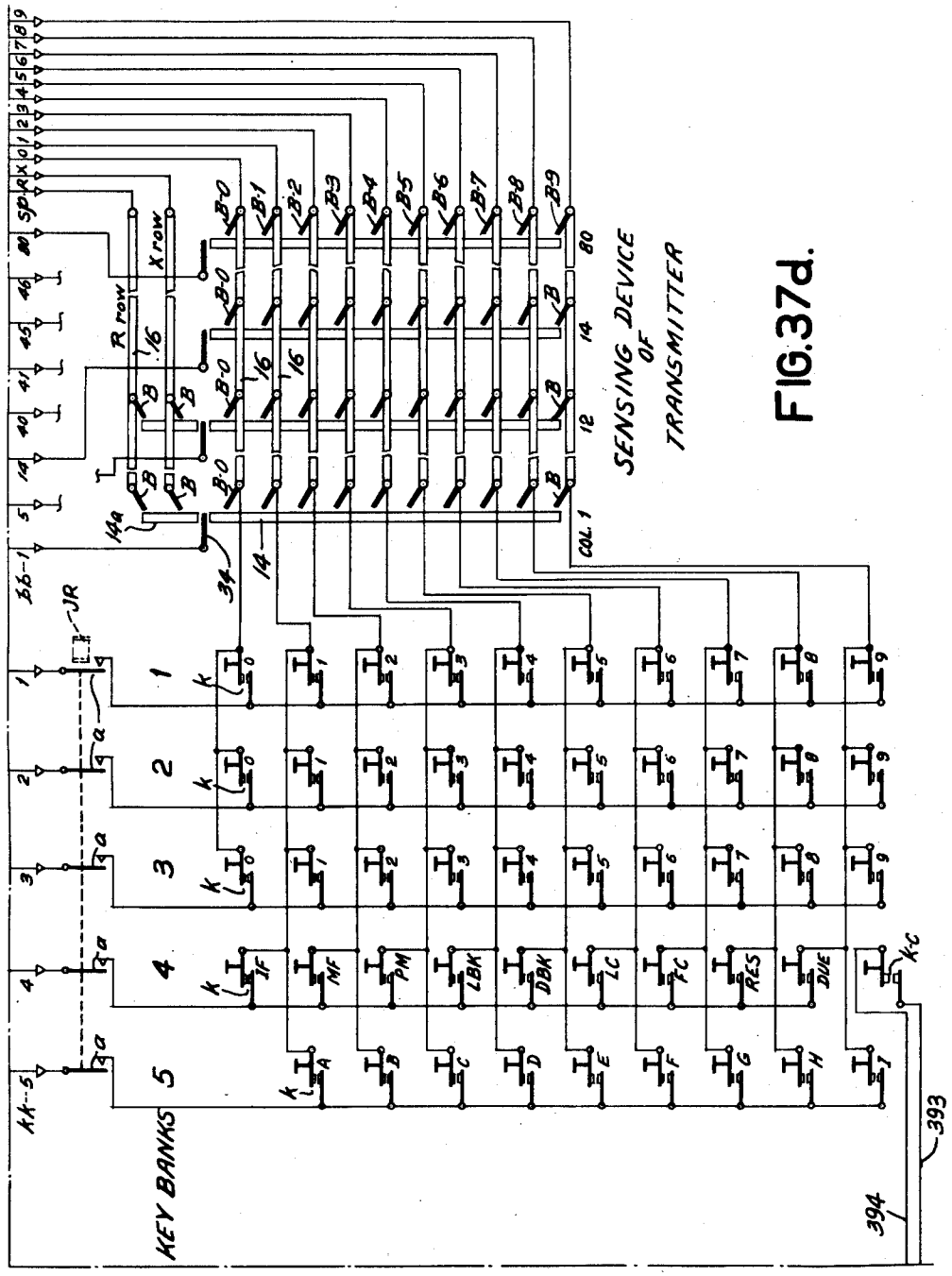


FIG. 37d.

INVENTORS
Albert W. Mills
Edward J. Palumbo
Frank K. Tapman
Edward J. Keough

BY W. M. Wilson ATTORNEY

Aug. 8, 1944. A. W. MILLS ET AL 2,355,389

RECORDING MACHINE

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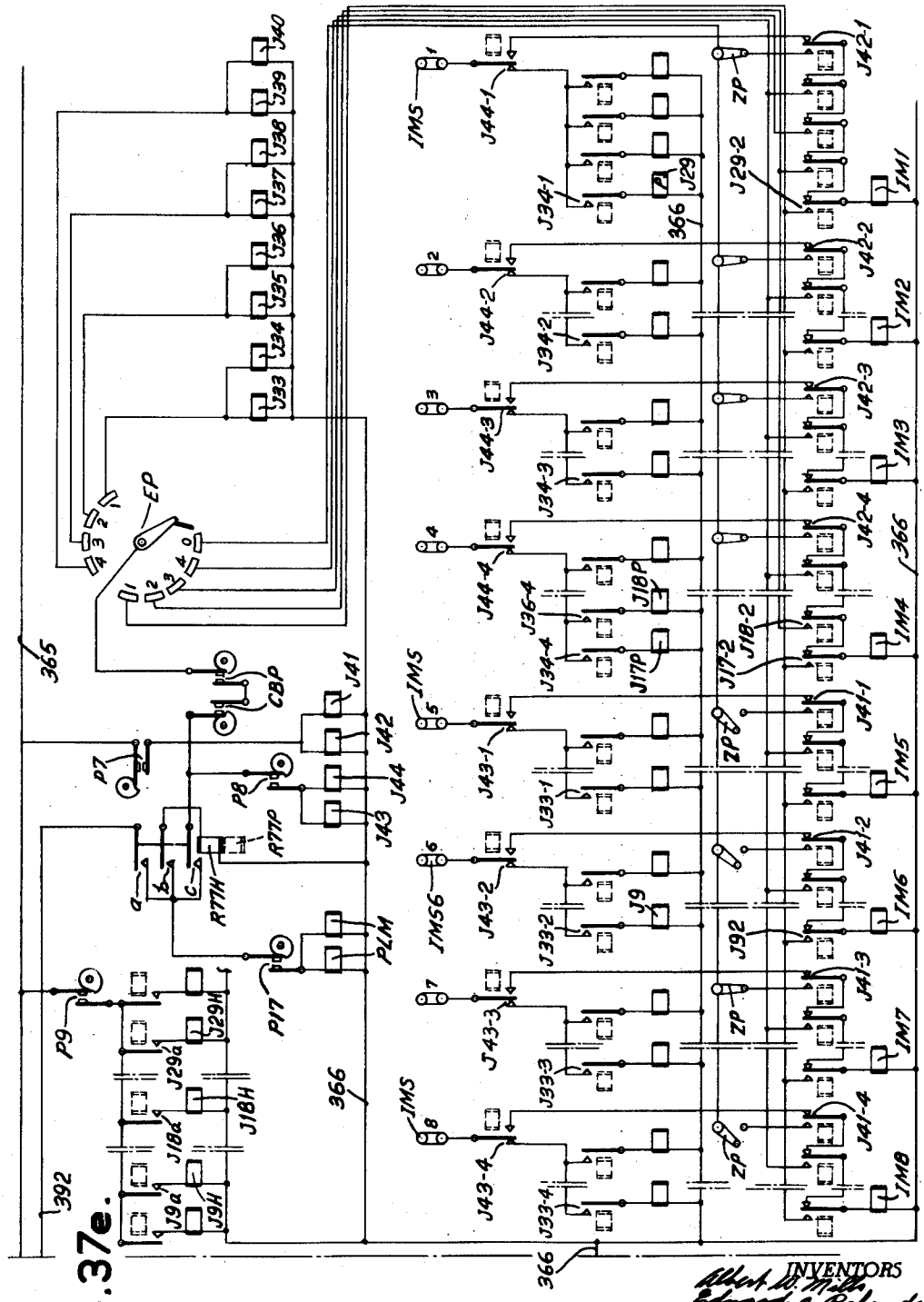


FIG. 37e.

INVENTORS
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Edmund J. Rabenda
Frank J. Furman
Edmund J. Stumpf

BY

ATTORNEY

Patented Aug. 8, 1944 2,355,389

UNITED STATES PATENT OFFICE

2,355,389

RECORDING MACHINE

Albert W. Mills, Endicott, Edward J. Rabenda, Binghamton, and Frank J. Furman, Endicott, N. Y., and Edward J. Keough, Stamford, Conn., assignors to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application December 24, 1942, Serial No. 470,038

40 Claims. (Cl. 164—113)

This case relates to a system for transmitting and recording data. Particularly, the system involves a transmitter at one location and a recorder or receiver at a remote location. The transmitter has means to receive insertable record material, such as record cards on which data are designated by perforations. The recorder has means to receive data transmitted under control of the inserted record material and to reproduce this data on record material such as record cards.

The general aim of the present invention is to provide an improved transmitter and recorder system for dealing with record sheets or cards on which data are designated.

An object of the invention is to provide a transmitter with settable means, such as a keyboard, for selecting and controlling transmission of data to the recorder to supplement the data derived from inserted record material in the transmitter.

Another object is to provide novel means to sense the data designations on inserted record material.

Another object is to provide means whereby automatic continuation of operation of the recorder independently of the transmitter will be prevented as long as the transmitter is connected up to the recorder.

Another object is to provide means whereby a cyclically operable recorder will have its cycles initiated under control of the remote transmitter, with each cycle being initiated as a result of operation of the transmitter to transmit the data of a transaction.

Another object is to provide means to check the record material inserted in the transmitter for presence or absence of errors on the record material.

Another object is to provide means to prevent re-conditioning of the transmitter for transmitting data of a next transaction unless a previous transaction has been properly transmitted or unless the record material in the transmitter has been properly punched with information to be transmitted.

Another object is to prevent operation of the transmitter unless it has been properly connected to the recorder unit or before the recorder unit is ready to receive and record information.

Another object is to provide for cancellation of a transmitted and recorded transaction.

To bring out other objects, the specific application of the invention to transactions occurring in a library will be considered. It will be clear, however, that the invention is of wider application to other transactions and is not to be considered as restricted to the illustrative application to a library system.

Two types of transactions occurring in a library will be dealt with. One is a so-called charge or loan transaction involving lending out of library material and the other is a return transaction involving return of the material.

Another object of the invention is to provide means to differentiate different types of transactions recorded under control of the transmitter.

Certain information; for example, identification of borrowed material is common to loan and return transactions. The identification data is taken in each case from the same columns of record material inserted in the transmitter. The recorder is to punch the common data in certain columns during a loan transaction and in different columns during a return transaction.

This object is to provide means whereby common data derived from the transmitter is recorded in one or another location depending on the type of transaction being performed.

Return transactions are recorded in locations of record cards other than the locations to receive loan transaction data. This permits of economy in card consumption since it enables a record card bearing data of one transaction to be used again to receive data of the other type of transaction. However, such previously recorded, re-used cards may come to recording position at the time the same type of transaction is to be transmitted. But, if such re-used cards should be those punched with loan transactions, they could not serve to receive new loan transaction data and, if such re-used cards are those with return data, they are not capable of receiving new return data. Actually, in the present case, cards bearing return data are those chosen for re-use service. It is stated now that there is no relation between return data on a card and loan data recorded thereon during its re-use. This is because no attempt is made to record return data on the same card bearing the mate transaction involving the loan of the returned material. Return transactions are always punched, in the present case, upon blank cards. These are then matched by means not pertinent to the present invention with the companion loan transactions. All accounting operations pertaining to these mate transactions are then completed, after which the paired loan data cards may be discarded. The paired return cards, however, are re-used to receive new and unrelated loan data. The card bearing both

loan and return data is treated as though it bore only the loan data, since the return data on such card relates to a finished pair of transactions and is no longer needed.

An object of the invention is to provide for the by-passing of a re-used card, recorded previously with a certain type of transaction, when the same type of transaction is to be transmitted at the time the re-used card comes to recording position.

Another object is to differentiate by-passed previously punched cards from cards punched with new transactions of the same type.

Another object is to feed a blank card into recording position automatically when a re-used card or cards are by-passed.

During a loan transaction, a book card and a borrower card are inserted in the transmitter. During a return transaction, the book card is inserted, but the borrower card is not inserted.

Another object is to provide means to suppress checking operations relating to certain data; for example, borrower data, when the record material bearing this data is not to be inserted in the transmitter during a certain type of transaction.

It is desired to record the date on which a loan transaction is made and the date on which the borrowed material is due. A normal loan period is assigned to most of the library material. Certain material, however, has a longer but fixed loan period. Further, library material may be lent, if desired, for any variable loan period.

An object is to provide for recording of certain information by similar designations in different columns and to impart differential significance to the designations by the location of the columns.

Another object is to provide for recording of certain data by similar designations in different columns related according to a combination code.

Another object is to provide for preset selection of data to be punched or recorded, with such selection to be auxiliary to selection of other data by the transmitter.

Another object is to suppress, under control of the transmitter, recording of certain data and to allow alternative data to be recorded.

Another object is to suppress recording of preselected data under control of the transmitter so as to enable variably selected data to be recorded.

Another object is to provide means to act under control of the transmitter to indicate, directly or indirectly, unwanted records of transactions. Such unwanted cards are those bearing the data of cancelled transactions.

For example, when the book or borrower card, during the transmission of a transaction, is found to be faulty in certain columns, means automatically detecting the faulty card or cards inserted in the transmitter will control offsetting means to offset a record card delivered to a stacker to indicate that the following card should be discarded. Further indication that a card is to be removed and not used as a record of transactions is given by printing an error or cancellation denoting character thereon. Another indication that something may be wrong with the inserted material in the transmitter is the failure of the transmitter to be released for continued operation. To release the transmitter, the operator depresses a cancel key. It may be desired to cancel a transaction for some reason other than that the inserted record material in the transmitter is faulty; as, for instance, when wrong data keys have been depressed and such error not noticed until after the transaction had been transmitted. In such event, the operator depresses the cancel key and, independently of the means for detecting faulty book and borrower cards, the depression of the cancel key will result in the offsetting of the card bearing the transaction to be cancelled and in the printing of the error indicium thereon.

Objects flowing from the above are to provide means to prevent continued operation of the transmitter when faulty book and borrower cards or either has been detected, to provide means for operating offsetting means in the receiver when a transaction is to be cancelled, and to provide means to record an error indicium on the card bearing the cancelled transaction.

Another object is to provide novel means for preventing operation of the transmitter unit and, thereby, operation of the entire system, including the recorder, unless record material has been properly inserted in the transmitter.

Another object is to provide novel interlock means between an operating handle of the transmitter unit and the main operating shaft thereof when the latter is restrained from following the handle.

Another object is to provide in connection with a keyboard of the transmitter unit, means to permit an operated key or keys to be retained in operated position or restored to unoperated position automatically at completion of a transaction, whereby repeat selection of data by keys may be effected for successive transactions with only a first, single operation of the keys.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

Brief Description

Briefly, the system comprises a transmitter unit electrically connected through wires in a cable with a recorder unit. Usually, the transmitter unit will be located in one room and the recorder unit in a different room, and a separate operator will be in attendance at each unit. The transmitter unit has a pocket to receive insertable record material punched with designations of data to be transmitted. The pocket is of a size to receive a single record card of the 80-column type disclosed in Patent No. 1,772,492. Such record card may be inserted for certain transactions not to be considered herein. In the transactions concerned with loan and return of library material, two stub cards are used. One such stub card is a so-called book card which has thirty columns adapted to be perforated with data designations. The book card accompanies and identifies the book or other library article or group of articles to be loaned as a unit. Such identification includes a class number, an accession or book number, and other classifying data and also has printed thereon the author, title, and class and accession number. The present invention is not concerned with the preparation of either the book card or the other stub card which is a borrower card. The borrower card has twenty-two columns adapted to be punched with data designations. These designations identify the borrower by an assigned borrower number and other classifying data. The borrower card also has the name and address of the borrower and the borrower number printed thereon. Since

the borrower card has twenty two columns and the book card thirty columns, they have a total of fifty two columns while the transmitter card pocket is of a size to accommodate an eighty column card. Accordingly, a separator is inserted in the card pocket to divide the pocket into a left hand sub pocket to accommodate the book card and a right hand sub pocket to accommodate the borrower card.

During a loan transaction, the book and borrower cards are both inserted in the card pocket. During a return transaction, the book card is again inserted but the borrower card is not inserted. In its place, a so-called return check card, not necessarily of cardboard material, is inserted. This return check card controls means to signify that a return transaction is to take place.

The transmitter is provided with electrical means to sense the perforations in the inserted book and borrower cards. Such sensing means includes a gang of conductive brushes which are brought into sensing position concurrently. The sensing af the perforations in the inserted record material selects transmission circuits which control the recorder unit to reproduce the sensed data.

The transmitter has a keyboard for selecting supplemental information to be transmitted. The keyboard comprises an operator identifying key bank, a classification key bank in which a cancel key also is included, and three value key banks; namely, a hundreds, tens, and units bank. These key banks close key contacts which select transmission circuits to mainly control the recording of supplemental information.

To transmit a transaction, an operating handle of the transmitter is actuated. The handle may be operated only if the recorder unit is in condition to receive information from the transmitter. The parts operated by the handle are retained in actuated positions until the transaction is completed. They are then released under control of the recorder. When an error in the book and borrower cards or either, inserted in the transmitter, has been detected by the recorder, the handle-operated parts of the transmitter will not be released until a cancel key is operated. The detection of such error will result in cancellation of the transmitted transaction. Such cancellation may also be effected, independently of the error detecting means, simply because of the operation of the cancel key.

The recorder unit is of the kind disclosed in Reissue Patent No. 21,133 and in an application of G. F. Daly, Serial No. 434,773, filed March 14, 1942. The recorder unit is of the cyclically operating type and means controlled by the transmitter initiates a recording cycle of the recorder unit for each transaction to be performed. Punching and printing means are provided in the recorder. The punching means will record transmitted information by selectively perforating index positions of columns of cards supplied in the recorder unit. The printing means will be utilized to print the book number on the card which bears a loan transaction, but not upon the card which bears a return transaction. When a transaction of either kind is cancelled, the printing means prints an error indication on the card. The cards to be punched will issue one after another from a supply hopper and will pass through the punching means first and then through the printing means from which they are brought to a delivery magazine. The cancellation of a transaction is manifested by operation of card offsetting means to offset the card preceding the one to be discarded and also by printing an error indication on the latter card.

When a return transaction is taking place, the punching of data by the recorder will take place in a set of columns exclusive of the columns in which a loan transaction may be recorded. Such shifting of the recording from one set of columns to another will be controlled by the return check card inserted in the transmitter.

A return transaction, in the present machine, will always be recorded on a blank card, and no attempt will be made to record the return transaction on the same card which bears the related loan transaction and which is the mate to the return transaction. To record the companion loan and return transactions on the same card would entail too much labor, expense, and delay. The time at which a return transaction is effected is indefinite. Hence, the companion loan card would only by improbable chance be in recording position at the happenstance time at which the companion return transaction is to be effected. Thus, if it were necessary to record the return transaction on the same card bearing the matching loan transaction, the transmitter operator would first have to signal the recorder operator that a return transaction is to be effected and also what particular loan transaction card is needed. The recorder operator would then have to pick out this particular loan transaction card from the file, place it in recording position in the recorder, and then signal back to the transmitter operator that the return transaction may now be carried out. Moreover, such manner of operation will require that only one card at a time be inserted in the recorder. It is obvious that this manner of operation is highly undesirable. Instead of attempting to record the companion loan and return transactions on the same card, the return transaction is recorded, according to the present disclosure, on a blank card. After the cards have been stacked in the delivery pocket of the recorder, they are removed and the load transaction cards separated from the return transaction cards. By means not pertinent to the present invention, the return cards then are collated with the companion loan cards and all accounting operations relating to these mate transactions then carried out. After such operations have been completed, the loan cards may be destroyed. The companion return cards also could be discarded, if desired, since the return data therein are no longer needed. But it is preperred, for the sake of card economy, to utilize the blank portions of the return cards to receive new loan data which, it will be clear now, will bear no relationship whatever to the return data. Accordingly, after the return data on return cards are no longer needed, such cards may be re-used to receive loan transaction data. For this purpose, previously punched return cards are mingled with blank cards in the supply hopper of the recorder. The return cards are each provided with a special perforation which is sensed by the recorder. When such return card is detected and a new return transaction is to occur at the time, means come into action to suppress punching on the previously punched return card and to automatically continue card feed until a blank card is brought to punching position. The previously punched return card is punched with an additional designation to denote that it has been bypassed and does not relate to a current return

transaction. Loan transactions, however, may be recorded on previously punched return cards, providing for economy in card consumption.

An auxiliary plugboard is provided in the recorder which is plugged up in accordance with the date on which a loan transaction is made and in accordance with the normal due day of the borrowed material. Further plugging of this plugboard is made in accordance with an extended due day. The transmitter determines whether the normal due day, the extended due day, or neither of these due days is to be punched.

In the drawings:

Fig. 1 is a plan view of a transmitter unit.

Figs. 2, 3, and 4 are sections along lines 2—2, 3—3, and 4—4 of Fig. 1.

Fig. 5 is a detail section through a designation sensing portion of the transmitter.

Fig. 6 is a section substantially along line 6—6 of Fig. 1.

Fig. 7 is a detail section showing the contacts operated by a return check card inserted in the card pocket of the transmitter.

Fig. 8 is a detail view of the return check card.

Fig. 9 is a detail section showing the relation between an interlock magnet and the operating shaft of the transmitter.

Fig. 10 is a detail view of the interlocks between the operating handle and the operating shaft of the transmitter.

Fig. 11 is a detail section showing transmitter contacts operated by the operating shaft of the transmitter.

Fig. 12 is a detail section through key bank 4 of the transmitter and is taken along line 12—12 of Fig. 1.

Fig. 13 is a detail section through a key and contact assembly and is taken along line 13—13 of Fig. 2.

Fig. 14 is a detail, end view of a separator insertable in the transmitter card pocket.

Fig. 15 is a detail elevation of the card chute of the transmitter unit.

Fig. 16 is a detail plan view of the designation sensing means of the transmitter.

Fig. 17 is a detail view of a card support and related parts of the transmitter unit.

Fig. 18 is a plan, sectional view of the transmitter unit.

Fig. 19 shows a card recorded on with loan data by the recorder unit under control of the transmitter unit.

Fig. 20 shows a portion of a card recording a return transaction.

Fig. 21 is a code table of month designations selectively perforated in the card of Fig. 19.

Fig. 22 is a view showing the book and borrower cards and separator inserted in the card pocket of the transmitter unit.

Fig. 23 is a side view of the recorder unit, with the casing removed.

Fig. 24 is a section through the recorder unit.

Fig. 25 is a detail of the platen operating linkage of the recorder unit.

Fig. 26 is a side view, partly in section, of the printing means of the recorder.

Fig. 27 is a section through the type wheel setting means of the recorder.

Fig. 28 is a detail section through the supply hopper of the recorder.

Fig. 29 is a detail section through the delivery pocket of the recorder.

Fig. 30 is a detail of certain drive mechanism of the recorder.

Fig. 31 is a section through the type wheel assembly.

Fig. 32 is an end view of drive mechanism shown in Fig. 30.

Fig. 33 is a detail section through the card eject and offsetting means of the recorder.

Fig. 34 is an end view of the card eject and offsetting means.

Fig. 35 is a timing chart.

Fig. 36 is a diagrammatic view of the plugboards and of illustrative plugging.

Figs. 37*a*, 37*b*, 37*c*, 37*d*, and 37*e* constitute the circuit diagram.

Fig. 38 is a chart showing the relation which Figs. 37*a* to 37*e* have to one another.

The records

Three different kinds of records are used in the present illustrative use of the invention; namely, a book card BK, a borrower card BR, and a tabulating card T. The book and borrower cards are shown in Fig. 22 in the positions they occupy in the pocket of the transmitter unit. The present invention is not concerned with the preparation of the book and borrower cards. The recorder unit will prepare cards T under control of the transmitter unit. A full card T is shown in Fig. 19 and a portion of a card T is shown in Fig. 20.

Each record card has columns spaced according to the spacing of columns of an 80-column card. There are twelve index positions in each column, identified as positions R, X, 0, 1–9 and perforations in these positions are correspondingly identified. Positions 9 to 0 are perforated according to the single hole, Hollerith code in which one perforation in one of these positions designates a corresponding value; e. g., a perforation in position 2 designates value 2. The book card BK has thirty columns and the borrower card has twenty columns. When these two cards are to be used to control a transaction, a separator S (Fig. 22) is inserted in the transmitter to space the cards apart, the effective length of the separator and of the book and borrower cards being the same as the length of the 80-column card T (Fig. 19). The book card has printed, at the top, the title and author of card material available for loan and is perforated with a class number, an accession number, hereinafter referred to as the book number, and other identifying data. Column 24 is adapted to be perforated in the 2 position when the material identified by the book card has an extended loan period, as is the case with the card shown in Fig. 22. When the material has a normal or special loan period, column 24 is not perforated in the 2 position and is preferably left blank. Printed on the card BK, at the right thereof, are the book number and class number. The book card accompanies the library material identified thereby.

A borrower card BR is given to each subscriber and has printed, at the top, the name and address of the borrower. Columns numbered 59 to 64 of the card BR are perforated to designate the borrower number and other columns are perforated with additional identification data of the borrower. The borrower number is also printed on the card.

Whenever a loan transaction is to be made; i. e., when library material is to be borrowed, the book and borrower cards are both inserted, together with the separator S, in the transmitter. Whenever a return transaction is to be made;

i. e., borrowed material to be returned, the book card alone is inserted together with the separator and with a so-called return check card, or token RC (Fig. 8) which takes the place of the borrower card.

Cards T are prepared by the recorder according to the present invention. Fig. 19 shows a card T punched with data pertaining to a typical loan transaction, while Fig. 20 shows a portion of a card T punched only with data pertaining to a typical return transaction. During a return transaction, columns 1 to 24 of card T are to be punched with data derived from columns 1 to 24 of a card BK, columns 40 to 43 of card T are to be punched with charge data, and column 80 of card T is to be punched with an operator code number. The charge data may include a charge classification to be designated in column 40 while amount or other data may be punched in columns 41, 42, and 43. The data to be punched in columns 40 to 43 and 80 is selected by a keyboard of the transmitter. Columns 59 to 76 of card T, during a loan transaction, are punched with data derived from columns 59 to 76 of a borrower card. The X or 11 positions of card T are used during a loan transaction to record the day loaned, month loaned, and day due information. Columns 1 to 31 are selectively perforated in the X position to designate the loan day; e. g., an X hole in column 7 denotes the loan day as the 7th day of the month. The X positions of columns 36 to 46 and 59 to 78 are numbered 1 to 31, as shown in Fig. 18, and are to be punched selectively to designate the due day; e. g. an X hole in the due day box 21 (card column 68) designates the 21st as the due day. Columns 32 to 35 are adapted to be punched combinationally in the X positions to designate the loan month. The various combinations are indicated in Fig. 21. In addition to the perforations made in the card T to designate a loan transaction, the book number is printed on the card. The numeral 1 when printed in the location indicated in Fig. 19 serves as an error indication, marking the card as one to be discarded. While a more suggestive symbol, or even word, could be used as an error indication, it is preferred to use the numeral 1 for this purpose because the mechanism for printing this character is already available in the machine and no additional and special mechanism is required.

During a return transaction, only columns 47 to 58 of a card T are perforated (see Fig. 20). Columns 47 to 53 then receive the book number, columns 54 to 57 receive the charge data, and column 58 receives the operator's code number. An X hole in column 58 is punched on each card T punched with return data. After the cards punched with return data have served their functions in subsequent accounting operations, they may be re-run through the recorder and used to record a loan transaction. If the re-run card arrives at the recording station while a new return transaction is to be attempted, the card is by-passed. To identify such by-passed card, it is punched with an X hole in column 53.

The Transmitter Unit

(Figs. 1 to 18)

This unit has a base 10 on which are mounted two side frames 11 and 12 of non-conducting material (Figs. 4, 6, and 18). Supported between the side frames is a block 13 of insulating material slotted to contain eighty vertical contact bars 14, spaced apart similarly to the spacing of columns of an 80-column card of the type disclosed in Patent 1,772,492. The bars 14 are fixed in position in block 13 and their front faces are flush with the front face of the block. Secured to the top, left hand edge of block 13 (as viewed in Figs. 16 and 18) is a smaller block 15 of insulating material and in which twelve short contact bars 14*a* (see also Fig. 3), alined with the twelve left hand bars 14, are rigidly set with their contact faces flush with the front face of block 15. The front faces of blocks 13 and 15 and contact bars 14 and 14*a* define the left side (Fig. 3) of a card pocket to receive record card material. The contact bars 14 and 14*a* comprise parts of perforation sensing means. When record material is inserted in the card pocket, the index positions 9 to 0 of each column of the record material are in front of the contact bars 14. The twelve left hand columns of an inserted book card have their index positions X and R in front of contact bars 14*a*. At the right side of the card pocket are rows of flexible contact brushes B which are normally clear of the pocket but which may be moved downwardly and forwardly into the pocket. These brushes B constitute shiftable parts of the sensing means for coacting with the contact bars 14 and 14*a* to search the inserted card material for perforations in the index positions of the card columns. There is one row of sensing brushes B for each row of index positions. To differentiate the rows of brushes B, they may be referred to by the index positions, X, R, 0–8, 9, which they are adapted to sense, e. g., brushes B4 sense the 4 row of index positions. There are eighty brushes B in each of the sets of brushes for sensing index position rows 9 to 0 and these brushes face the contact bars 14 and are adapted to engage them through perforations in the inserted record material. There are twelve brushes B—X and twelve brushes B—R facing the contact bars 14*a* and adapted to engage them through perforations in positions X and R of the twelve left hand card columns of inserted record material.

Brushes B are carried by twelve rocker plates 16 of conductive material. Each plate 16 is provided with studs 17 seated in bearing holes in side frames 11 and 12. The plates 16 are provided at the rear with tabs 18 intruding into recesses 19 formed in two similar pairs of members 21 and 22. The recesses are shaped to enable the tabs 18 to swivel therein.

Members 21 and 22 are pivotally hung from the free ends of pairs of rocker arms 23 and 24. Arm 23 is pivotally mounted on side frame 11 and arm 24 is similarly mounted on the side frame 12. Each rocker arm carries a roller 26 engaged with one of a pair of duplicate cams 27 fixed to an operating shaft 28. The brush-carrying plates 16 provide bridging connections between the pairs of members 21 and 22 suspended from rocker arms 23 and 24 and thereby also serve to connect these rocker arms for common rockable movement. A spring 29 is connected to rocker arm 23 and urges the assembly of rocker arms and members 21 and 22 downwardly, maintaining rollers 26 engaged with cams 27. When shaft 28 is turned about forty-five degrees counterclockwise (Figs. 2 and 3), cams 27 act on rollers 26 to elevate arms 23 and 24 and members 21 and 22. Members 21 and 22, as they rise, rock the brush carriers 16 counterclockwise, with the result that the brushes B move downwardly and forwardly to search the index positions of the inserted card material for perforations. Those brushes which find perforations engage therethrough with the facing contact bars 14 or 14*a*

to partially complete indicia transmitting circuits which will be traced later. Upon return of shaft 28 to home position, the assembly of rocker arms 23 and 24 and members 21 and 22 returns to lower position, causing brush carriers 16 to rock clockwise back to the positions shown in Figs. 2 and 3. In these positions of the brush carriers, the brushes B are clear of the card pocket and record card material may be freely inserted.

Any of the twelve left hand columns of an inserted record card are adapted to be perforated in the X or R index position and also in one of the positions 0 to 9. The remaining card columns may be singly punched in one of the index positions 9 to 0. To avoid back circuits, the contact bars 14 and 14a are separated. The X and R designations of a card are read out at a different time of a cycle than the 9 to 0 designations and advantage is taken of this fact to provide a single shiftable set of return brushes 34 for the two sets of contact bars 14 and 14a. There are eighty brushes 34, one for each of eighty card columns. During the cycle period in which the 9 to 0 designations are read out, the brushes 34 will be shifted into engagement with upper rearwardly extending horizontal portions of contact bars 14. During the cycle period in which X and R designations may be read out, the brushes 34 will shift into engagement with horizontal portions of contact bars 14a.

Brushes 34 are carried by a block 35 of insulating material which serves as the cross bar of a brush bail having opposite side arms 36 and 37 provided with pivots 38 journaled in side frames 11 and 12. Bail arm 36 is connected to links 42 and 43. The links 42 and 43 are connected to plungers of solenoids 0—9 and X—R mounted on a shelf 48 bridging the side frames 11 and 12. Energization of solenoid 0—9 rocks the brush bail clockwise (Fig. 2) to engage the brushes 34 with contact bars 14. Energization of solenoid X—R shifts the brushes 34 in opposite direction to engage contact bars 14a. A pair of spring-connected jaws 46 (Fig. 3) pinch a tab 37a, extending from lever 37, to resist movement of the brush bail in either direction and to urge it to maintain neutral position, with brushes 34 disengaged from contact bars 14 and 14a, when neither solenoid is energized (see Fig. 3). A bar 49 of insulating material is fastened to the side frames 11 and 12. Bar 49 is cut away along one end to fit around the block 15 (see Fig. 18). Bar 49 serves as an insulating stop to upward movement of the brushes 34 except those left hand brushes, upward travel of which is stopped by contact bars 14a or block 15.

Brushes 34 are fastened in ferrules 34a, flattened at their rear ends to have wiping engagement with terminal spring blades 50. Blades 50 are carried by a block 52 of insulating material which is supported at the ends by angle brackets 53 secured to the side frames 11 and 12. Cable wires 54 are connected to terminal blades 50 and connect them into the circuits traced later. The ferrules 34a wipe the blades 50 in all positions of the brush bail.

The left side of the card pocket is defined by the blocks 13 and 15 and contact bars 14 and 14a as previously explained. The bottom of the card pocket is defined by a card supporting plate 55 attached to the bottom of block 13. The right side of the card slot is defined by a plurality of vertical, narrow strips 56 of insulating material. There are twenty-seven strips 56 spaced apart to enable the sensing brushes B to protrude between them (see Figs. 16 and 18). The strips 56 engage, at their upper ends, in comb slots of an angle bar 58, shaped as shown in Figs. 2, 3, and 16 and vertical ends of which fit into slits 59 formed in side frames 11 and 12. The lower ends of the strips 56 are notched to engage the corner edge of a cross bar 61 attached to the side frames. A bar 62 of resilient material, preferably rubber, is located in the crotch of cross bar 61 and abuts the strips 56. Intermediate their length, the strips 56 engage in comb slots formed in the card supporting plate 55 (see Fig. 17). By their engagement with plate 55 and bars 58 and 61 and resilient bar 62, the strips 56 are held at proper distance from the blocks 13 and 15 and form a grill-like right side of the transmitter pocket, with the spaces between the strips permitting brushes B to intrude therethrough its coaction with contact bars 14 and 14a. It will be noted that the bar 62, by reason of its resiliency, acts in the manner of a spring serving to push the strips 56 into firm engagement with bar 55.

Attached to side frames 11 and 12 is a card hopper 63 (see the detail view, Fig. 15). End guide strips 64 (see Fig. 16) are fastened to block 13 to serve as end guides for material inserted through the card hopper into the transmitter pocket. The transmitter pocket is long enough to accommodate a full size card (Fig. 18), but for transactions to be performed according to the present invention, the stub cards BK and BR (Fig. 21) or return check card RC (Fig. 8) are to be inserted. All of these cards and check card RC may be referred to as record material. In order to locate the cards BK and BR or check card RC properly in the receiving pocket, the latter is subdivided into left and right sub pockets by insertion of separator S (see Figs. 1, 4, 6, 14, and 21). The left sub pocket is adapted to accommodate a card BK while the right sub pocket may take either a card BR or the return check card RC.

The separator S has a handle or head portion and a body portion dependent from the head portion. The head portion has lugs 66 to fit into notches 63a of the card hopper 63 and is recessed at the sides, providing inclined walls 67 to facilitate insertion of the cards BK and BR or check card RC. The body portion of the separator is flat, made of insulating material, and is thinner at the sides to provide shoulders 68 for abutting the inner, vertical edges of inserted material. When the cards BK and BR or check card RC are inserted, their inner side margins overlap the thin margins of the separator body and are thereby isolated from the brushes B. This prevents any brushes B from slipping past the inner vertical edges of the inserted material and engaging with the contact bars 14 and 14a. When card BK is inserted, its thirty columns, numbered 1 to 30 (Fig. 22) confront the brushes B of the first thirty columns. The card BR, when inserted in the pocket, has its twenty columns, numbered 59 to 80, opposite the brushes B of columns 59 to 80. When check card RC is inserted in place of BR, it insulates the latter brushes from contact bars 14. The brushes of intermediate columns 31 to 58 are insulated by the body of separator S from the contact bars 14.

The return check card RC has a bottom tab 70 (see Fig. 8) which, upon insertion of the check in the transmitter pocket cams against an inclined edge of a lever 73 (see Fig. 7), forcing the lever counterclockwise. Lever 73 is of insulating

material and pivoted on a bracket 74 attached to card support 55 (also see Fig. 17). When the lever is rocked counterclockwise, it acts on a central, spring blade 75 of a switch assembly to open contact TC2 and closes tab contacts TC1. In the fully inserted position of check card RC, the tab RC*a* has passed the inclined edge of lever 73 and is abutting the front vertical edge of the lever, thereby holding the lever in counterclockwise position. At the same time, the spring blade 75 acts through lever 73 to releasably retain the check card in fully inserted position.

Operating shaft 28 is journaled in side frames 11 and 12 and its right end (Fig. 4) extends past the frame 12 and has fixed thereto an arm 80 (Figs. 10 and 18). This arm is connected by a coil spring 81 to an arm 82 to which an operating handle 83 is suitably coupled. When the handle is moved forwardly; i. e., towards the front of the machine, arm 82, through spring 81, causes arm 80 and its shaft 28 to follow.

Under certain conditions, explained hereinafter, shaft 28 cannot follow the forward movement of operating handle 83. To prevent stretching the spring 81 beyond its limit under these conditions, interlock means are provided to stop the handle after it has moved forward a short distance. The interlock means comprises a hook latch 84 pivoted to arm 82 and urged by a spring 85 into abutting engagement with a stud 86 carried by arm 80. In the home position of the parts, the hook end of latch 84 is a short distance in front of a stop lug 87*a* provided on a bracket 87 fixed to side frame 12. If the shaft 28 is not restrained from following the operating handle, the arms 80 and 82 and latch 84 will move counterclockwise (Fig. 10) in unison and the hook end of latch 84 will describe an arcuate path outside stop lug 87*a*. On the other hand, should shaft 28 be unable to follow handle 83, arm 80 will remain stationary and, as the handle moves to the left, latch 84 will move likewise, sliding along stud 86, until the hook end engages stop 87*a*. This will stop further movement of the handle. When shaft 28 is free to follow the handle, both move to the limit of their forward strokes. The handle is stopped at the end of its forward stroke by a lug 87*b* of bracket 87.

One condition under which shaft 28 is unable to follow handle 83 arises when the card pocket is not properly filled with record material. The pocket is properly occupied when either a full size card is fully inserted therein or when the separator S and two cards BK and BR are fully inserted or when the separator and card BK and return check card RC are fully inserted. To prevent operation of shaft 28 when the card pocket is not properly filled, interlock means are provided, including a pair of levers 90 (see Figs. 2, 3, 6, and 17). Levers 90 are pivotally mounted on brackets 91 secured to card supporting plate 55. One lever 90 is at the bottom of the left (BK card) sub pocket while the other lever is at the bottom of the right (BR card or check RC) sub pocket. The levers 90 are individually pivotally connected to a pair of links 92, the right hand portions of which are freely slidably supported and guided by angle bars 94. The angle bars are attached to a shelf 95 which is carried by and between side frames 11 and 12. Springs 96 connected to studs 92*a* of links 92 urge the links to the right to maintain pins 92*b* on the links against edges 99*a* of arms 99 fixed to main shafts 28. In home position of the shaft (Figs. 2 and 3), arms 99 hold the links 92 at their left hand limit, in which connected levers 90 are in clockwise position. In such position of the levers, the lower edges of inserted card material may move between the upper ends of the levers and the left side of the card pocket.

Studs 92*a* of links 92 pass through slotted ends of bell crank latch levers 97. The levers 97 are pivotally mounted on brackets 98 carried by shelf 95. Levers 97 will be rocked clockwise by links 92 when the links move to the left and counterclockwise when the links move to the right. The levers 97 have hook ends 97*a* normally below the paths of movement of lugs 99*b* provided on arms 99. Should shaft 28 turn forwardly; i. e., counterclockwise and links 92 be free to follow and move to the right, levers 97 will quickly rock counterclockwise and interpose their hook ends 97*a* in the paths of lugs 99*b*, thereby arresting shaft 28 after a short forward travel of the shaft. A link 92 may move freely to the right only if record material has not been fully inserted in the sub pocket at the bottom of which the connected lever 90 is disposed. Thus, if record material has not been inserted or not fully inserted in either sub pocket, at least one of the levers 90 may move freely counterclockwise until stopped by a confronting edge of card supporting plate 55. Correspondingly, a link 92 may move freely to the right and rock connected lever 97 counterclockwise to engage an arm 99 of shaft 28, thereby arresting forward turning of the shaft before brushes B have been moved into the card pocket. On the other hand, when record material is fully inserted in the sub pockets, both levers 90 are stopped by the record material from moving counterclockwise. Accordingly, both levers 97 remain substantially in the positions shown, and shaft 28 may perform its full forward stroke.

The other condition under which shaft 28 is unable to perform its forward stroke arises when the recorder unit has not been properly connected to the transmitter or when the recorder unit is not ready to receive and record information transmitted by the transmitter unit. In either case, an interlock magnet TIR (Figs. 2, 9, and 18) will remain deenergized. This magnet is mounted on shelf 95 and its armature 103 is normally maintained by a spring 104 (Fig. 9) in clockwise position. In this position, the upper end of the armature is under an arm 105 fixed to shaft 28, blocking forward turning of the shaft. Energization of magnet TIR removes the armature from under arm 105, enabling shaft 28 to perform its forward stroke.

Shaft 28 is latched in position at the end of its forward stroke. The latching means includes a lever 108 pivotally mounted on side frame 11 (Figs. 2, 3, and 18) and urged counterclockwise by a spring 109. The upper end of lever 108 pivotally carries a latch element 110 urged downwardly by a spring 112 into the position shown in Fig. 3. Fixed to shaft 28 is an arm 113 formed with a transverse lug 113*a*. A spring 114 connects the lug 113*a* to the frame and serves as a restoring spring for the shaft 28. Upon forward turning of shaft 28, lug 113*a* of arm 113 cams against the front of lever 108 moving the lever rearwardly. When the shaft 28 approaches the end of its forward stroke, lug 113*a* meets latch element 110 and rocks it clockwise until the lug is squarely in front of the notch 108*a* in the lever 108. At this point, the lever 108 is free to move counterclockwise under the influence of spring 109, and notch 108*a* embraces the lug 113*a*. The latch element 110 then serves as an

upper, yieldable stop for the lug 113a and forces the lug against the bottom of the notch 108a. In this manner, the shaft 28 is latched in position at the end of its forward stroke. To unlatch the shaft 28, a restoring solenoid RS must be energized. Energization of this solenoid draws in its plunger 116, moving an angular member 117 to the right. The vertical leg of member 117 engages a stud 108b of lever 108 and moves it to the rear against resistance of spring 109, thereby releasing lug 113a of arm 113. Spring 114 thereupon returns shaft 28, clockwise, to home position. An arm 115 on shaft 28 engages a rubber bumper 116 (Fig. 9) at the completion of the return movement of the shaft. As the shaft 28 returns to home position, it serves through spring 81, connecting arms 80 and 82 (see Fig. 10), to restore the operating handle 83. In order to dampen the return movement of the shaft 28 and handle 83 and the related parts, a dash pot 120 (Figs. 2 and 18) is provided. The dash pot is carried by a bracket 121 secured to side frame 12. The plunger 122 of the dash pot is connected to a slidable plate 123. The plate has a pivotal connection to an arm 124 fixed to shaft 28. Accordingly, as shaft 28 turns, the arm 124 through its connection to plate 123 causes movement of plunger 122. The dash pot acts on the plunger 122 in a direction to dampen the clockwise or return stroke of shaft 28 and connected parts.

As brought out later by the circuit description, solenoid RS is energized for a brief interval following recording operation under control of the transmitter. The action of solenoid RS on latch lever 108 correspondingly is effective for only this brief interval. The operator may, however, inadvertently maintain the handle 83 down in operated position for a time overlapping the interval of energization of the solenoid. The latch lever 108, upon deenergization of the solenoid, will attempt to relatch the arm 113 and shaft 28. Should such action be allowed to occur, the operation of the recorder unit will be prevented from restarting, such restart requiring restoration of shaft 28, as will be made clear in the subsequent circuit description. The latch element 110 of the lever 108 prevents relatching of the arm 113 after deenergization of solenoid RS and until the handle 83 is released to permit shaft 28 to return. Thus, with the lever 108 in latching engagement with arm 113 and with the handle 83 being held down by the operator, then upon energization of solenoid RS, lever 108 rocks clockwise to an extent such as to withdraw the bottom of notch 108a from lug 113a and to withdraw the bottom of latch element 110 from above the lug. Spring 112 thereupon snaps element 110 downwardly, placing the vertical shoulder of element 110 in front of lug 113a. This prevents the lever 108 from returning counterclockwise, after deenergization of solenoid RS, as long as the operator, by maintaining the handle 83 down, retains the shaft 28 and, thereby, the arm 113 in counterclockwise position. Arm 113 and shaft 28 thereby will remain unlatched after deenergization of solenoid RS to permit it to return upon release of handle 83 by the operator. To relatch the arm 113, the shaft 28 must be allowed to restore and the handle 83 must be depressed anew by the operator.

To prevent forward (counterclockwise) movement of the shaft 28 beyond a limit position, an arm 125 fixed to the shaft is engageable with a rubber-tipped stop bumper 126.

In addition to transmitting information derived from inserted indicia bearing record cards, the transmitter unit may transmit supplemental information selected by a keyboard. This keyboard has five banks of keys marked 5, 4, 3, 2, and 1. Key bank 5 is the operator or clerk key bank which is used to set up a codal designation of the operator or clerk or librarian. Key bank 4 is an information classifying key bank used to set up a class or charge code designation and also includes a cancel key K—C. Key banks 3, 2, and 1 are the hundreds, tens, and units value banks, respectively and are used to set up amounts, most frequently dollars, tens of cents and cents values. Some of the keys are dummy keys as far as the present use of the machine is concerned; that is to say, there are certain keys which in the present application of the machine are not utilized to set up information or to effect any control operations and these keys are omitted from the circuit diagram. The keys of the different banks may be referred to and identified hereinafter by the common designation K followed by the legend marked on the key button; e. g. K—G refers to the third key from the bottom in key bank 5. The classifications set up by the key bank 4 relate to the amount set up by key banks 3, 2, and 1. The classifications assigned to the keys of bank 4 may be varied as desired, and the keys will bear symbols consistent with the desired classifications. For instance in the illustrative embodiment, the keys "IF" to "O Due" are used during return transactions for the classifications noted at the left in Fig. 1. For loan transactions, the classification keys ordinarily will not be used, since it will be understood that the amount set up by banks 3, 2, and 1 will be a monetary charge for the loan of the book. In two special loan transactions, the keys IF and MF are used for the classifications noted at the right in Fig. 1. In one such loan transaction, key IF will be used to classify the amount set up by key banks 3, 2, and 1 as a count of books loaned to another library. In another special loan transaction, key MF will be used to classify the amount as a special loan period. Depression of the key MF during a loan transaction also will suppress recording of a regular loan due day and of an extended loan due day, all of which will be explained in detail hereinafter.

Each key bank is a separate assembly including a framework 128 (see Figs. 2, 12, and 13). The frameworks 128 of the five key banks are fastened to front and rear cross bars 129 (only the front bar is shown) secured to the side frames 11 and 12. After the key bank assemblies have been fixed in place, cover plates 130 (also see Fig. 1) are attached to the cross bars 129. Each key bank is of a well-known commercial type and its framework 128 includes a slidable latch bar 132 having apertures through which the key stems pass. A flat spring 133 acts on the end of latch bar 132 to urge it to the right (as viewed in Fig. 12). When a key is depressed, the lug 134 thereof cams the slide bar 132 to the left (Fig. 12) until the top of the lug is below the slide bar, whereupon spring 133 returns the slide bar to the right and the depressed key is thereby latched down. It may be noted that the cancel key K—C is not provided with a lug 134 for camming the slide bar 132 and will not be latched down when depressed but will return under the influence of the key spring 136 as soon as the operator releases the key. Each key when operated, depresses an associated vertical slide strip

138 of insulating material. This strip carries a wiper contact 139 which, upon depression of the key, bridges a pair of contacts 140 and 141 carried by a plate 142 of insulating material which is secured to framework 128. For convenience, each set of related contacts 139, 140, and 141 may be designated, in entirety, as key contacts *k* and shown in the circuit diagram as an equivalent pair of normally open contacts.

It may be desired to release depressed keys at the completion of each operation of the transmitter unit or, alternatively it may be desired to maintain a key or keys in the different banks latched down for several operations of the transmitter unit. For example, as long as the same operator is operating the transmitter unit, the operator-identifying key may be latched down since the operator's code is to be repeatedly transmitted during a plurality of operations of the transmitter unit. For determining whether a depressed key should be released or remain latched down, each key bank has associated therewith a manipulative key lock lever 150 (Figs. 1 and 2). Each lever 150 is individually pivoted on a stud 151 carried by an individual angle piece 152 (also see Fig. 18) which is secured to the front cross bar 129. The lever 150 is notched to coact with a spring latch 154 to retain the lever in adjusted positions. Each individual lever 150 is connected by a link 155 to an interponent 156 pivoted intermediately to an arm 157 fixed to a common shaft 158. This shaft is journaled in side frames 11 and 12 and has fixed to it all the five arms 157, one for each lever 150. Also fixed to shaft 158 is an arm 159 connected by the previously mentioned member 117 to the plunger 116 of restoring solenoid RS (see Figs. 3 and 18). It will be recalled that energization of this solenoid is effective to release the latch lever 108 from arm 113 of operating shaft 28, enabling the shaft to return to home position. At the same time as the solenoid unlatches shaft 28, it is also effective through link 117 and arm 159 to rock the shaft 158 and its arms 157 clockwise. As the arms 157 move clockwise, they bring the connected interponents 156 to the right (Fig. 2). If an interponent is in the position shown, its free end is in front of the end of latch bar 132 of the related key bank (see Fig. 12). Accordingly, if the interponent is moved to the left, as viewed in Fig. 12 or to the right, as viewed in Fig. 2, it will encounter the end of latch bar 132 and shift it to unlatch a previously depressed key K. An interponent 156 is in the position shown, when the key lock lever 150 to which it is linked is in forward position (clockwise, as viewed in Fig. 2). The key lock lever 150 is moved by the operator to this position when it is desired to release the depressed key of the related key bank at the end of each information transmitting cycle of the transmitter unit. When it is desired to leave a depressed key of a key bank latched down for a plurality of information transmitting cycles of the transmitter unit. the operator moves the key lock lever 150 associated with this key bank to the rear. In the rear positon of lever 150, it acts through link 155 to set the interponent 156 in counterclockwise position (Fig. 2) in which its free end is in a plane above the key latch slide 132. With the interponent in such position, when moved to the right (Fig. 2), upon energization of solenoid RS, it will not encounter the latch bar 132. Hence, the previously depressed key of the related key bank will remain latched down.

A depressed key may also be unlatched by depressing another key (except the cancel key) in the same key bank.

Shaft 28 has fixed thereto an arm 165 (Figs. 11 and 18) which is provided with a roller 166 of insulating material. In the home position of the shaft 28, the roller 166 engages a spring blade 167 to maintain a pair of transmitter contacts T1 and T2 open. When the shaft 28 is moved through its forward stroke, roller 166 withdraws from spring blade 167, permitting contacts T1 and T2 to close in succession. As shaft 28 completes its forward stroke, roller 166 engages a spring blade 168 and successively closes a pair of transmitter contacts T3 and T4.

Mounted on shelf 48 is a magnet JR (Fig. 13) which, when energized, close a group of contacts JR*a* in the key circuits shown in the circuit diagram.

A casing 169 is attached to side frames 11 and 12. A green signal lamp GN and a red signal lamp RD are exposed by the casing (see Fig. 1). The green lamp will light when the apparatus including the transmitter and receiver are in "go" condition while the red lamp will light when the apparatus is in "no go" condition. The wires leading from the electrical elements of the transmitter are connected to wires in a cable 170 (Fig. 1) which is brought to the recorder or receiver unit. This unit responds to electrical signals corresponding to information transmitted by the transmitter unit and has means to record the information by punching columns of an 80 column card T (Fig. 19) and to record part of the information by printing on the card, such printing being known as interpretation of punched data on the card.

The Recorder

(*Figs. 23 to 34*)

This unit reproduces information transmitted by the transmitter unit and utilizes punching and printing mechanisms such as found in an application of G. F. Daly, Ser. No. 434,773, filed March 14, 1942. The recorder unit is provided with a suitable drive motor (shown diagrammatically and designated DM in the circuit diagram, Fig. 37*a*). The motor, through a belt 180 and pulley 181 (Fig. 23) rotates a main shaft 182 (also see Fig. 30) on which is a gear 183 meshed with a gear 184 to drive a shaft 185. Pinion 186 on shaft 185 meshes with a gear 187 to rotate this gear and an attached gear 188, both gears 187 and 188 being freely mounted on a shaft 189. Gear 188 drives a gear 190 meshed with a gear 192 which through a gear 194 drives a gear 196 on a cam shaft 197 carrying a cam 198 for operating cam contacts CR. Shaft 189 on which gears 187 and 188 are rotatably mounted may be referred to as the card cycle shaft and is driven through one-revolution clutch means by gear 187. The clutch means includes an arm 199 on shaft 189 carrying a clutch dog 200 engageable in a notch of a clutch disk 201 fast to gear 187. Energization of a clutch magnet PCM releases the dog 200 to engage the notch in disk 201, establishing drive connection from gear 187 to shaft 189. A gear 202 on shaft 189 drives a gear 203 meshed with a gear 204 on a shaft 205. Shaft 205, through gearing 206 rotates a cam shaft 208 on which are cams 209 for operating certain of the cam contacts generally designated P.

A supply hopper 210 (Figs. 24 and 28) receives the cards to be operated on in the recorder or receiving unit. The cards are placed in the hopper face down and with the 12 index position leading. A weight 211 is placed on top of the stack of cards. When the supply of cards is running low, the card weight reaches a position in which it rocks a lever 212 to tilt a mercury contact switch HMS of known form to closed position. The closure of switch HMS establishes a buzzer signal circuit, which will be traced hereinafter, to warn the operator that the card supply is low and should be replenished. If the operator fails to heed the signal and the cards are exhausted, the machine will stop as a result of the opening of hopper contacts PHC. As long as at least one card remains in the hopper, its surface bears on one end of a lever 214 to hold contacts PHC closed.

Card pickers 215 are carried by racks 216 meshed with gear sectors 217 fixed to a shaft 218. Card cycle shaft 189 carries complementary cams 219 (Fig. 30) acting on a two-armed lever 218a to oscillate shaft 218 and the gear sectors 217. The gear sectors reciprocate racks 216 and pickers 215. On their forward stroke, the pickers feed the bottom card from hopper PH to a first set of upper and lower feed rolls 220. The card is advanced by these feed rolls past the PX brush station at which a brush PX (Fig. 24) coacts with a common contact bar 221 to sense a selected column of the card for an X perforation. As the card travels through the PX brush station, it rocks a lever 222 to close card lever contacts DCL, shown only in the circuit diagram, Fig. 37a. Each PX brush device is adjustable transversely along a bar 223 and is clamped in desired column sensing position by a thumb screw 224.

As the card leaves the PX brush station, it enters a punching station. Located at the punching station is a transverse row of punches 225 (Fig. 24), one for each card column, and a coacting die 226. The card will be fed intermittently to place the rows of index positions 12, 11, 0–9 successively in punching position between the punches and die. Pivoted to the upper end of each punch 225 is an interposer hook 230 spring-urged anticlockwise against a spring-pressed stop 232. Hook 230 is connected by a link 233 to armature lever 234 of a punch magnet PM. Upon energization of a magnet PM, the related hook 230 is drawn towards the tip of an oscillatable punch operating frame 235. During the down stroke of this frame, the hook will embrace the tip of the frame and the connected punch will be forced through the card. Punch operating frame 235 is continually oscillated by connecting rods 236 from eccentric portions 237 of a shaft 238 (also see Fig. 26). This shaft is driven by gearing 239 from main shaft 182 (see Fig. 30). As the punch-operating frame is making its up stroke, punch magnet PM will be deenergized, permitting the interposer hook 230 to withdraw from the punch operating frame. A knock-off member 240 is provided for positively dislodging hook 230 from the punch-operating frame. There is one punch magnet PM, link 233, connected hook 230, and punch 225 for each card column. One or more of the punch magnets will be energized during each of successive cycle points of a card cycle to cause punching, in desired columns, of the index positions in the row of such positions then located in punching position. During successive index points, successive rows of index positions are under the punches, so that the punching will take place in index positions of one row, then in index positions of the next row, and so on.

As the card emerges from the punching means, it reaches a second set of feed rolls 245 which complete the feed of the card through the punching means and feed it through a regular sensing station to a third set of feed rolls 246. The regular sensing station has a transverse row of sensing brushes PB, one for each card column, and which coact with a common contact roll PCR to sense the index positions 12, 11, 0–9 in succession. As the card reaches the brushes PB, it operates on a card lever 243 to close the second card lever contacts PCL. The third set of feed rolls 246 completes the feed of the card through the regular sensing station and advances it through a printing station to a set of eject rolls 247. The latter rolls eject the card from the printing station and bring it to a second set of eject rolls 248. Rolls 248 move the card to a stacker magazine PS where the cards stack up on the usual spring-elevated platform 249. Eject members 250 fixed to a shaft 251 complete ejection of the card into magazine PS. Eject rolls 247, 248 and 250 are rotated by gearing from card cycle shaft 189. This gearing includes previously mentioned gear 203 (Fig. 23), driven by gear 202 on shaft 189. Gear 203 through gear train 252 rotates cam shaft 253. A gear 254 on this shaft acts through idler gear 255 to rotate the pinions 256 on the shafts of lower eject rolls 247 and 248. The shaft of lower rolls 248 operates through gears 257 to rotate the shaft 251 of eject members 250 (also see Fig. 34).

Shaft 253, referred to above, carries cams for operating still others of the cam contacts generally designated P. It should be noted that shafts 208 and 253 are driven by card cycle shaft 189 in one-to-one relation thereto. The P cam contacts are, therefore, operated once each card cycle and may be called the card cycle cam contacts. Any other of the shafts driven one-to-one by shaft 189 may carry cams to operate additional P contacts; for example, the shaft of gear 255.

Means are provided to transversely offset a card from other cards in the stacker pocket when certain controls explained in the circuit description call for such offsetting. A card is offset by axially moving the shaft 251 of eject members 250 while they are engaging the card to complete its ejection. The shaft 251 is mounted for axial displacement, being slidably coupled to the hub sleeve of a gear 257 and maintained in normal position by a spring 258 (see Fig. 33).

Whenever card offset is called for, offset magnet OM (Fig. 34) momentarily is energized, releasing armature latch 259 from a lever 260. This lever rocks clockwise (Fig. 34) under the influence of a spring 261 and remains unlatched until positively restored by a cam 263. When lever 260 rocks clockwise, it causes counterclockwise rocking of a lever 260a. The lower end of lever 260a thereby is disposed in the path of a spiral face cam 262 fixed to shaft 251. Consequently, as shaft 251 rotates, cam 262 coacts with lever 260a to cause the shaft to move to the right (Fig. 34). The cam is so disposed that the movement of the shaft to the right occurs as members 250 engage the card to complete its ejection. As a result, the card, as it is ejected, is laterally offset. As soon as the members 250 release the card, a cam 263 on shaft 251 acts on lever 260 to restore levers 260 and 260a to initial positions, in

which lever 260 is relatched by armature lever 259. Spring 258, at the same time, returns shaft 251 to its normal left hand position (Fig. 33).

When the stacker pocket is nearly full, the platform 249 rocks a lever 249a (Fig. 29) to tilt a mercury switch PMS to closed condition in which it will cause the previously mentioned buzzer signal to warn the operator that the cards should be removed from the stacker pocket. Should the operator fail to heed the signal, the platform 249, when the stacker pocket is filled, operates the lever of a switch PSS to cause the machine to stop.

Since the card is to be punched row by row and the printing operation is to be effected while the card is momentarily at rest, the first three sets of feed rolls 220, 245, and 246 are intermittently driven by means such as disclosed in Reissue Patent No. 21,133. This means includes a Geneva gear 264 (Fig. 30) fixed to a shaft 265 and cooperating with a driving roller 266 and a locking hub 266a, both carried by gear 183 which is secured to main shaft 182. The Geneva gearing does not transmit drive to the first three sets of feed rolls except when the card cycle shaft 189 is in operation and for this purpose, clutch means is provided between the Geneva gear and a gear 267 from which drive is transmitted to these feed rolls. The clutch means between the Geneva gear and gear 267 comprises a single-notched collar 267a fixed to gear 267, both being loose on shaft 265. Fastened to shaft 265 is a member 268 carrying a clutch dog 269 engageable in the notch of collar 267a to couple the gear 267 to Geneva gear 264 for common steps of rotational movement. When the card cycle shaft 189 is declutched and in home position, complementary cams 270 thereon act on a lever 271 to cause the upper end of the lever to hold the clutch dog 269 released from collar 267a, as a result of which the gear 267 will remain uncoupled from Geneva gear 264 and the first three sets of feed rolls will not operate. When the card cycle shaft 189 is in operation, complementary cams 270 act on lever 271 to permit the clutch dog 269 to couple the gear 267, each card cycle, to the Geneva gear. The main shaft 182 makes fourteen revolutions a card cycle and during a portion of each fourteenth part of the cycle, the roller 266 effects a step of rotational movement of the Geneva gear. With gear 267 coupled to the Geneva gear, it drives gears 272 and 273 fixed to the shafts of the upper feed rolls 220 and 245 (also see Fig. 23). Gear 273, through an idler 274, drives a gear 275 fast to the shaft of upper feed roll 246. The upper and lower feed rolls of each set are geared to each other as usual. Each step of movement of the Geneva gear 264, when gear 267 is coupled thereto, effects a step of rotational movement of the feed rolls 220, 245, and 246 to advance the card one index position row. The Geneva gear and these feed rolls idle during the punching operation occurring within a cycle point after which the feed rolls advance the card to bring the next index position row under the punches, and so on until the card has been completely punched and subsequently printed on. Contact roll PCR of the regular sensing means is driven in unison with the intermittently rotated feed rolls by suitable gearing (see Fig. 23) actuated from the shaft of one of the feed rolls 245.

Since card pickers 215 feed the card from the hopper by continuous movement while the first pair of feed rolls 220 are intermittently driven, means are provided to separate these feed rolls while the pickers are feeding a card therebetween. This means comprises arms 278 in the upper ends of which the shaft of the lower feed roll 220 is journaled. The arms 278 are slotted intermittently to allow a shaft 279 to pass therethrough. Cams 280 on shaft 279 act on rollers 278a at the lower ends of arms 278 to depress the arms and the lower feed rolls 220, separating them from the companion feed rolls while a card is being advanced therebetween by the pickers 215. Shaft 279 is continuously rotated through gear 282 from the continuously driven gear 188 (see Fig. 30).

The printing means, located between the set of feed rolls 246 and the set of feed rolls 247 (see Fig. 24), comprises typewheels 290. The typewheels are frictionally driven by means including a shaft 291 (Figs. 26 and 27) to which a drum 292 (also see Fig. 31) is suitably secured. Keyed to drum 292 are shouldered collars 293. The lowest or "1" order typewheel 290 is freely mounted on the shouldered left end of drum 292. The other typewheels are freely mounted on the collars 293. A retainer 294 is fastened to the right end of the drum 292. Friction rings 295 attached to the left sides of the typewheels engage adjacent faces of the collar and drum assembly. The right sides of the typewheels carry spring washers 296 provided with friction rings 297 engaging adjacent faces of the collars and of the retainer 294. Pins 298 extend from the typewheels through apertures in the spring washers to compel the washers and the friction rings 297 to move rotationally with the typewheels. Through the friction drive connections including friction rings 295 and 297, shaft 291 releasably drives the typewheels. Shaft 291 carries a gear 300 (Figs. 24 and 26) meshed with gear teeth 301 on a lever 302. The arms of lever 302 are provided with rollers 303 following complementary cams 304 on a shaft 305. Fixed to shaft 305 is a bevel gear 306 meshed with a bevel gear 307, the hub of which is journaled on the inside of a collar 308 and coupled to shaft 253 to be rotated thereby. It will be recalled that this shaft is in rotation whenever the card cycle shaft 189 is in operation. Rotation of shaft 253, through bevel gears 306 and 307, drives shaft 305. During each revolution of shaft 305, cams 304 thereon oscillate lever 302 which, through gear teeth 301 similarly oscillates gear 300 and the typewheel drive shaft 291. Through the friction connections, shaft 291 oscillates the typewheels 290. A long tooth 290a is provided on each typewheel engageable with the opposite stop bars 312 and 313 to limit the opposite strokes of the typewheel. The upper half of the typewheel is provided with types 5, 1, 6, 2, 7, 3, 8, 4, 9 and 0 in the order named. The opposite half of the typewheel has teeth 314, one for each type lug. Each typewheel may be arrested, during its counterclockwise stroke, to set a desired type in printing position. For this purpose, stop pawls 315, one for each typewheel, are provided. Normally, the stop pawls are latched up by armatures 316 of printing or interpreting magnets generally designated IM. Energization of a magnet IM releases associated stop pawl 315 for clockwise movement by a spring 317 connected between the stop pawl and a related zero pawl 318. When the released stop pawl is moved clockwise, it intercepts a tooth 314 of the typewheel, arresting the wheel with a type in printing position. The differential timing of the en-

ergization of magnet IM, which will be clear from the subsequent circuit description, determines which type will be set in printing position. Zero pawls 318 comprise elements of means to prevent printing of zeros to the left of a first significant digit. The zero pawls are freely mounted on a rod 319. A restoring bail 320 is common to all the stop and zero pawls. Bail 320 has a follower roller 321 coacting with a cam 322 on cam shaft 305. The follower end of the bail is concavely shaped to coact with an arcuate element 324 provided on the hub of cam 322. During the early part of a card cycle, the cam 322 will cause the bail 320 to move to its counterclockwise limit. The front bar 320a of the bail thereupon restores the tripped stop pawls into latching coaction with the armatures 316 of magnets IM. At the same time, the rear bar 320b rocks all the zero pawls 318 counterclockwise beyond the position shown in Fig. 27. Shortly after, by the "5" cycle point, the follower end of the bail 320 drops until its concavely shaped right hand end rests on arcuate element 324. The zero pawls follow the rear bar 320b under the influence of springs 317 and assume the position shown in Fig. 27. Each zero pawl, except the "1" order pawl and except also the "6" order pawl, for this special case, has a finger 326 underlying the next lower order zero pawl. The purpose and effect of omitting the finger 326 of the "6" order is to divide the typewheels into two sets, one set comprising the 8th, 7th, and 6th orders and the other set comprising the 5th to 1st orders. When a stop pawl 315 of a set has been tripped to arrest the related typewheel with one of the significant digit types in printing position, it retains the companion zero pawl 318 and, through tabs 326, all the zero pawls in the following lower orders, of the same set, in the position shown in Fig. 27. Accordingly, the stop pawls 315 of all these lower orders are free to trip should the related magnets IM receive zero impulses, so that the typewheels of these lower orders may be set with the "0" types in printing position. Those zero pawls 318 associated with orders of a set of the typewheels above the highest order wheel, of the set, which has been arrested with a significant digit type in printing position remain free to rock clockwise. Slightly before the zero impulse time of energization of the magnets IM, the concave edge of the follower end of the bail 320 drops off the element 324 and the bail assumes its clockwise limit. Those zero pawls 318 which have not been retained in the position shown in Fig. 27 follow the bail 320 clockwise until their edges 318a abut the stop bar 327. With edges 318a engaging bar 327, the zero pawls are in a position in which their upper ends 318b are under the ends 315a of the related, still untripped stop pawls 315. Accordingly, the latter stop pawls will be locked in ineffective position even though the associated magnets IM should be energized in response to zero impulses. The typewheels associated with the locked stop pawls will move to their counterclockwise limit and none of their types will be presented at printing position.

An inking ribbon 335 is guided across the faces of the types at printing position and is wound on spools 336 suitably actuated to feed the ribbon.

The printing operation is effected by a platen 340 between which and the typewheels the card is fed. Platen 340 is attached to a bail 341 pivoted at 342. Pivoted at their lower ends to bail 341 are hooks 344 urged rearwardly by springs 345. Links 346 connect the hooks 344 to armature levers 347 of magnets PLM. When these magnets are energized, the links 346 draw the hooks 344 forwardly towards an oscillating bail 347 which is part of a structure 347a (see Figs. 25 and 26) pivoted at 348. The structure 347a is oscillated through connecting rod 349 by an eccentric portion 350 of the shaft 238. This shaft, it will be recalled, is continuously driven from main shaft 182 while the motor is running and is also the shaft with eccentric portions which impart oscillation to the punch operating frame 235. When the hooks 344 are moved towards bail 347, they engage the tip of the bail during a down stroke thereof, and during continuation of its down stroke, the bail depresses the platen 340 to force the card against the inking ribbon and the typewheels at printing position thereby effecting printing on the card. During the return stroke of the bail, the magnets PLM are deenergized and springs 345 retract hooks 344.

Main and auxiliary plugboards are provided and shown diagrammatically in Fig. 36. The main and auxiliary plugboards are designated 355 and 355A, respectively. The manner in which the plugboards are plugged up, in connection with the library transactions previously explained, is indicated in Fig. 36. It may be mentioned that some of the plug sockets of the main plugboard 355 are shown in Fig. 36, merely for convenience of illustration, in different positions than they actually occupy on the plugboard.

Plugging

(Fig. 36)

A socket PXS wired to the PX brush is plugged to a socket SX to enable a previously punched, re-used return card (see Fig. 20) to be detected as it moves to the punching station.

The sockets PBS, wired to the brushes PB (also see Fig. 37c) of columns 8 to 14 are plugged to sockets IMS—8, 7, 5, 4, 3, 2, and 1, respectively, of the printing or interpreting means (also see Fig. 37e). This serves to control interpretation of the book or accession number in card columns 8 to 14 by the magnets IM of the 8, 7, 5, 4, 3, 2, and 1 orders.

Special control sockets SC are provided. Socket SC—1 is plugged to socket IM—6 to control printing of an error indication by the magnet IM of the sixth order.

Sockets DD (also see Fig. 37c) are associated with detecting circuits for detecting faulty record material in the transmitter. Sockets BB are wired to the return brushes 34 of the sensing means in the transmitter (also see Figs. 37c and 37d). There are eighty sockets BB, one for each of the return brushes. Sockets BB8—14 relate to the book number field of columns 8 to 14 of the book card BK (Fig. 22). These sockets BB8—14 are plugged to sockets DD14—20 to enable detection of a faulty book number field. Sockets BB59—64 are associated with columns numbered 59 to 64, of the borrower card BR (see Fig. 22), which designate the borrower number. Sockets BB59—64 are plugged to sockets DD8—13 to enable detection of a faulty borrower number field of columns.

The auxiliary plugboard 355 has two sections of sockets 1A and 2A. Each section has four rows of sockets. The third row of a section is a continuation of the first row and the sockets of these rows are called the upper sockets of the section. The fourth row of each section is a continuation

of the second row, and the sockets of these two rows are called the lower sockets of the section. The unnumbered sockets of the first two rows of section 1A are the "common A" sockets. Following these "common" sockets are upper and lower sockets 1 to 35 which relate to columns 1 to 35 of a card T. Sockets 1 to 31 of section 1A pertain to the loan day and the upper and lower paired sockets are connected by jack plugs except for those sockets corresponding to the day on which the loan transactions are to occur. Thus, in Fig. 36, the jack plug between upper and lower sockets 7 of section 1A is removed, and these sockets are plugged to the "common A" sockets. This plugging provides preselection of 7 as the loan day and an X hole will be punched in column 7 to designate this loan day, as indicated in Fig. 19. The upper sockets 32, 33, 34, and 35 of section 1A comprise the month-loaned common. One or a combination of these upper sockets 32 to 35 are plugged to one or more of the companion lower sockets 32 to 35 in accordance with the loan month designation to be punched. In Fig. 36, upper and lower sockets 32 and 33 are plugged to preselect May as the loan month and X holes will be punched in columns 32 and 33 to designate May (see Figs. 19 and 21). Section 2A has upper and lower "common L" sockets followed by upper and lower sockets marked 1 to 31. These pertain to the due day for the borrowed material. The correspondingly numbered sockets are plugged to each other except for those pertaining to the normal due day and an extended due day which, in the present case, is a week later than the normal due day. In Fig. 36, sockets 14 of section 2A are not plugged to each other but are plugged to "common L," affording a preselection of 14 as the normal due day to be designated by an X hole in box 14 of card T which is alined with card column 61 (see Fig. 19). Sockets 21 are not plugged to each other but are plugged to "common E" sockets of section 2A. This affords preselection of "21" as the extended due day to be designated by an X hole in box 21 located in card column 68. The card shown in Fig. 19 is punched with this extended due day designation. If the normal due day were "31," the extended due day would be "7" of the next month. For such due days, the sockets 31 of section 2A would be plugged to "common L" and the socket 7 of section 2A would be plugged to "common E." It may be mentioned that either the normal or extended due day but not both will be designated on any one card T.

Seven column splits are used herein. Each column split (also see Fig. 37*a*) includes an 11—12 socket, a 0—9 socket, and a com. (common) socket. The purpose of these column splits is, in general, to isolate certain control circuits made at the X or 11 time of a cycle from control circuits made at one of the 0 to 9 times of a cycle. The 11—12 socket and the common socket of each column split are connected to each other during the "12" and "11" times of a cycle by the closure of the normally open side of transfer contacts R11*a* (see Fig. 37*a*). These contacts are shifted by energization of coils R11 by a circuit made through cam contacts P2 (see Figs. 35 and 37*a*). After the "11" punching time, the cam contacts P2 open and coils R11 are deenergized. Consequently, during the 0 to 9 period of the cycle, contacts R11*a* are in normal condition, shown in Fig. 37*a*, and the 0—9 socket of each column split is connected to the common socket of the same column split by the normally closed side of one of the R11*a* contacts.

Since the day loaned, month loaned, and day due designations are X holes in columns which may also contain perforations in positions 8 to 0, three of the column splits are utilized for the control circuits relating to these columns. Column split 1 has its 11—12 socket plugged to a socket XS which is wired to a cam contact P6 (see Fig. 37*c*) closed during the "11" punching time of the cycle (see Fig. 35). The middle or 0—9 socket and the common socket of column split 1 are plugged, respectively, to the upper and lower parts of "common A," of section 1A, of the auxiliary plugboard. The lower sockets 1 to 35 of section 1A are plugged to sockets PP1 to PP35 which are wired, as indicated in Fig. 37*c*, to the punch magnets PM of columns 1 to 35. With the plugging in Fig. 36, the punch magnet PM of column 7 will be operated during a loan transaction to punch an X hole in this column to designate the loan day. The upper sockets 1 to 24 of section 1A are plugged to those sockets BB1 to 24 which are connected to the transmitter brushes B of colunms 1 to 24. Through the plugging to sockets 1 to 24 of section 1A, the BB1 to 24 sockets and PP1 to 24 sockets are connected to each other. Others of the sockets of sections 1A and 2A are plugged in the manner indicated in Fig. 36 to indirectly connect BB sockets to PP sockets with further control by column splits 2 and 3. The BB8 to 13 sockets are directly plugged, in addition, to sockets PP47—52 to enable the first six columns of the book number to be punched into columns 47 to 52 during a return transaction. The last column 53 of the book number field of the return card will be punched by a circuit plugged from BB14 via column split 7 to socket PP53. It should be noted that sockets BB8—14 are also plugged directly to sockets DD14—20, multiple plug wires being used whereever necessary. Some of the special control sockets SC are plugged to the 11—12 sockets of column split devices for purposes which will be brought out in the circuit description.

Sockets KK are associated with the key contacts of the transmitter (also see Figs. 37*c* and 37*d*). Socket KK5 is plugged through split column device 4 to PP58 and directly to PP80 to enable the operator number to be punched in column 58 during a return transaction and in column 80 during a loan transaction. Socket KK4 is plugged through split column device 5 to socket PP54 which, in turn is plugged to upper socket 5 of section 2A. Through such plugging, the key-selected value classification designation will be punched in column 54 on a return transaction (see Fig. 20) and in column 40 on a loan transaction (see Fig. 19). Sockets KK3, 2, and 1 are plugged to sockets PP55, 56, and 57 to enable the value selected by key banks 3, 2, and 1 to be punched in columns 55 to 57 on a return transaction. Sockets KK3, 2, and 1 also are plugged to upper sockets 6, 7, and 8 of section 2A to enable columns 41 to 43 to be punched with a keyboard selected value during a loan transaction. Socket PP58 is not only connected to socket KK5 through split column device 4 but is also plug-wired through this device to an XS socket so that an X hole will be punched in column 58 on a return transaction (see Fig. 20). Socket PP53 is plugged through split column device 7 to socket SC7 as a result of which, an X perforation will be made in column 53 of a by-passed return card, in a manner explained later.

Circuits and Operation

(Figs. 35 and 37a to e)

For convenience, each of the wires in cable 170 (see Fig. 1) which connects terminals of the transmitter and recorder is shown in the circuits with an arrow at each end. Some of these cable connections are designated generally by letter N, others by letters *pp*, and others by letters *sp*. Some of the relays are of the dual coil type with a pick up coil and a hold coil acting upon common relay points. Such relay unit will be designated by one symbol, its relay contacts will be designated by the symbol followed by a small letter, the pick up coil will be referred to by the symbol followed by letter P and the hold coil will be referred to by this symbol followed by letter H.

It is assumed that an A. C. voltage supply is being used. A main switch 361 (Fig. 37*a*) is closed at the recorder end to place power on lines 362 and 363, setting a motor-generator unit M—G in operation. The motor-generator unit supplies 40 V. D. C. to opposite plus and minus circuit lines 365 and 366.

Cards T, including blank cards and intermingled previously punched return cards, are placed in supply hopper PH of the recorder, immediately closing hopper contacts PHC (see Fig. 24) to establish a circuit through hopper relay coil R3 (Fig. 37*a*). With the recorder and transmitter connected to each other, as soon as power is supplied to circuit lines 365 and 366, a circuit is established through a relay coil R22. Referring to Figs. 37*a* and 37*b*, this circuit extends from line 365 via wire 367 to connection N1, thence to connection N9 and through coil R22 to line 366. Hereinafter, connection N1 may be referred to as the plus connection.

The recorder operation is begun by depressing a start key (Fig. 37*a*) to close contacts ST, completing a circuit from line 365 via contacts R37*a*, stop key contacts SK, contacts ST and through start relay R10 to line 366.

Energized R10 closes R10*a* contacts to form a stick circuit via cam contacts P5. Contacts R10*b* close and establish a circuit branching through relays HD and R9. Relay R9 closes contacts R9*a* to provide a stick circuit for coils R9 and HD, timed by cam contacts CR. The HD relay closes relay switch HD1 to complete the circuit of recorder drive motor DM. Contacts R10*c* also have been closed and establish the circuit of double-coil clutch magnet PCM by way of cam contacts P1. Motor DM and the clutch magnet being now in operation, the recorder performs machine and card cycles. The first card is fed from supply hopper PH, closes card lever contacts DCL and stops, at the end of the first cycle, just about at the punch line. Contacts DCL being closed, coil R1 is energized. Coils R3 and R1 are now both energized and a second holding circuit for R10 coil is made via stacker switch PSS, contacts R3*a* and R1*a*, normally closed contacts R2*a*, the left side of now-shifted contacts R22*a* and via contacts R10*d* through coil R10 to line 366. Cam contacts P5 open near the end of the first cycle, breaking the first stick circuit of R10. Later in the cycle, contacts P3 make and a circuit is formed via these contacts and relay contacts R1*b* through coil R2P. Coil R2P closes contacts R2*b* to establish a circuit for coil R2H via cam contacts P4 which holds over into the next card cycle. Coils R2P and R2H are thus energized each card cycle as long as cards are feeding to the punching station and maintaining card lever contacts DCL closed and coil R1 energized. Upon energization of relay R2, contacts R2*a* open and break the second stick circuit of start relay coil R10. Assuming the operator has released the start key, all the circuits through coil R10 are open and the coil is deenergized shortly after "13" of the first cycle at which time relay R2 was energized. Contacts R10*c* open to prevent clutch magnet PCM from being re-energized so that card cycle shaft 188 is declutched at the end of the first cycle. Contacts R10*b* opened to break the main circuit of coils R9 and HD, and when cam contacts CR subsequently open, these coils are deenergized. The contacts HD1 open and break the circuit of motor DM.

At the end of the first card cycle, relays R1, R2, R3, and R22 are in energized condition. To signal the transmitter operator that the machine is ready for operation and to release the restraint of the armature 103 of interlock magnet TIR (see Fig. 9) from operating shaft 28 of the transmitter, green lamp GN (Fig. 1) will now be lit and the interlock magnet will now be energized by the following circuit: From plus connection N1 (Figs. 37*a* and *b*) to connection N12, contacts R3*b* and R1*c*, connection N11, thence in parallel, via wires 370 and 371 through lamp GN and magnet TIR to bus 372 which leads via connection N37 to line 366.

Hereinafter, connection N37 may be referred to as the minus connection and bus 372 as the minus bus.

Magnet TIR, being energized, releases its armature 103 from restraint on transmitter shaft 28. Lamp GN, being lit, signals the transmitter end that the recorder is ready to receive information from the transmitter. The operator may now insert record material bearing the desired information and may also operate keys K for supplemental information to be transmitted. Proper insertion of the record material in the card pocket of the transmitter releases shaft 28 for operation. The handle 83 is now operated to effect the forward stroke of shaft 28. The shaft is latched up by lever 108 at the end of its forward stroke. Brushes B are now in coaction with contact bars 14 and 14*a* to sense the record material for indicia. Also, transmitter contacts T4 (Fig. 11) are now closed by roller 166.

With transmitter contacts T4 closed, a circuit is completed from plus connection N1 via T4 contacts (Fig. 37*b*) to connection N4, thence via contacts RS6*a* and through a relay coil R23 to line 366.

Contacts R23*a* now close to establish an automatic start circuit for the recorder. This circuit is from line 365 via R37*a* (Fig. 37*a*), stop key contacts SK, stacker switch PSS, now-closed contacts R3*a*, R1*a*, RS6*b*, R23*a* to connection N8 (also see Fig. 37*b*), thence to connection N5 and through start relay R10 to line 366.

Relay R10 now initiates operations, as before, to cause the recorder to perform a card cycle. The first card will be fed step by step through the punching station.

Punching operations are timed by an emitter SP (Fig. 37*c*), a brush of which engages emitter segments R, X, 0—9 in synchronism with the arrival of the corresponding index positions of the card at the punch line.

A Loan Transaction

Operations pertaining to a load transaction will now be explained. It will be assumed that

the card at the punching station is a blank card T. It will be assumed, further, that transmitter operator D (4) has inserted the book and borrower cards shown in Fig. 22 and that a charge of 15 cents is to be made. To set up this charge, keys K0, K1, and K5 of key banks 3, 2, and 1 (Fig. 1) are depressed and latched down. When these keys are depressed for a charge amount on a loan transaction, none of the keys of key bank 4 need be depressed. To set up the desired code operator number 4, key K—D of bank 5 is depressed and latched down.

Coil R23 has been energized and has closed contacts R23*b*, establishing the following circuit (Fig. 37*a*): From line 365 via cam contacts P16, the normally closed side of contacts RS8*a*, contacts R23*b*, and through coil RS3P to line 366.

Contacts RS3*a* close to complete a circuit, via wire 373 (see also Fig. 37*c*) and cam contacts P19, through hold coil RS3H.

Relay RS3 may be termed the transmission-enabling relay and must be energized to enable information to be transmitted from the transmitter unit to the recorder unit to be reproduced by the latter unit.

Relay RS3 closes contacts RS3*b* (Fig. 37*a*) and a circuit is completed from line 365 via RS3*b* through connection N43 and double coil magnet JR (Fig. 37*b*) to minus bus 372.

Magnet JR (also see Fig. 3) closes the group of JR*a* contacts in the transmitter key circuits (see Fig. 37*d*).

At about "13.6" of the cycle, cam contacts P22 close and a circuit is completed (Figs. 37*a* and *b*), upon closure of relay contacts RS3*b* at "13.7" of the cycle, from line 365 via RS3b and P22 and connection N42 through solenoid 0—9. As a result, return brushes 34 of the transmitter are shifted into engagement with contact bars 14 of the sensing means for inserted record material. Cam contacts P22 open at "14.1" of the cycle, terminating a first period of energization of solenoid 0—9 before the emitter SP engages its brush with the first of the emitter segments; namely, segment R. The brushes 34 (see Figs. 3 and 37*d*) will thus be temporarily engaged with contact bars 14 for a reason which will be made clear hereinafter under the heading "Extended due day punching."

After cam contacts P22 open, cam contacts P13 close and a circuit branches from contacts RS3*b* via P13 to connection N41 and through solenoid X—R to minus bus 372. This circuit remains effective until P13 opens shortly after "11" of the cycle, at a time which is after the punching period for an X or 11 perforation. Solenoid X—R remains energized and the return brushes 34 remain engaged with contact bars 14*a* through the 11 and 12 or X and R punching times of a cycle to enable X and R perforations in the first twelve columns of inserted record material to be sensed and circuits to be closed therethrough at the "12" and "11" times of the cycle as emitter SP brush wipes emitter segments R and X.

Upon the opening of cam contacts P13 and deenergization of solenoid X—R, cam contacts P14, in parallel with cam contacts P22, close and the circuit of solenoid 0—9 again is made. Solenoid 0—9 remains energized during the period covering the "0" to "9" sensing and punching times of the cycle. During this second period of energization of solenoid 0—9, return brushes 34 are engaged with contact bars 14 and emitter SP brush wipes emitter segments 0 to 9 to time the closure of sensing and punching circuits.

At "14.3" of the card cycle, cam contacts P12 close and a circuit (see Fig. 37*c*) is completed from line 365 via P12 and the normal side of transfer contacts RS8*b* and through punch control relays R43 to R50 and R53 to R56 to line 366.

Relays R43 to R50 close their *a* relay contacts in the circuits of punch magnets PM (Fig. 37*c*) for columns 1 to 46 and relays R53 to R56 close their *a* relay contacts in the circuits of the punch magnets for columns 59 to 80. It may be noted that if RS8*b* contacts were shifted, the above mentioned relays would not be energized but, instead, relays R51 and R52 would be energized. Relays R51 and R52 would then close relay contacts in the circuits of the punch magnets for columns 47 to 58. The shifting of contacts RS8 occurs, in a manner explained later only when a return transaction is to take place.

During energization of solenoid X—R, the recorder is capable of punching X and R holes selected by the transmitter. However, as previously explained, when the invention is to be used for recording library transactions, including loan data and due data to be selected independently of the transmitter and designated by X holes in card T, the R and X holes will not be punched under control of a selection made by the transmitter. In such case, there will be no R and X holes prepared in columns 1 to 12 of the inserted record material and there will be no necessity to reproduce such holes in card T. The plugging of the machine as shown in Fig. 36 is expressly intended for the application of the invention to library transactions and in connection with which the loan and due data are to be X punched in the card, and the machine will not be plugged in this manner when R and X holes are required to be punched in a card T in accordance with a selection made by keys or by inserted record material in the transmitter. To carry out the latter requirement, at least for columns 1 to 12, the sockets BB1 to 12 would not be plugged to sockets PP1 to 12 by way of the auxiliary plugboard but would be plugged directly to sockets PP1 to 12 or any others of the sockets PP, depending on which columns of card T are to be punched with the R and X holes selected by the transmitter. A punch circuit would then be made to reproduce an R hole sensed, for instance in column 1 of inserted record material as follows (start with Fig. 37*c*): Line 365, make and break contacts CB, now-closed relay contacts R2*c* and R23*c*, the brush and the R segment of emitter SP, connection *sp*—R (continue with Fig. 37*d*), the brush B in column 1 of row R, contact bar 14*a* of column 1, the brush 34 now engaged with this contact bar, the connection *bb*—1, socket BB1 (Fig. 37*c*) by plugwire (not shown) to socket PP1, punch magnet PM of column 1, and via a now-closed *a* point of relay R43 to line 366.

The above circuit would be made at the "12" cycle time (see Fig. 35) and energization of PM magnet, column 1, would cause the R hole to be reproduced in column 1 of a card T.

Before proceeding with the description, it is repeated that the above circuit and other R and X circuits are not to be made under control of selections by inserted record material or keys in the transmitter when the machine is plugged as shown in Fig. 36. In the subsequent description, it is assumed that the machine is operating in accordance with the plugging shown in Fig. 36.

During the second period of energization of

solenoid 8—9 timed by cam contacts P14 to occur between "11.3" and "9.3" of the cycle, any 0 to 9 values sensed in the inserted record material or selected under control of the keyboard of the transmitter may be reproduced or punched in the card T. As an example, the punching of column 14 of card T (Fig. 19) with a 1 hole, reproducing the 1 hole in column 14 of inserted card BK (Fig. 22) will be explained. At the "1" time of the cycle, the following punch circuit (see Figs. 37c and d) is completed: From line 365 via circuit breakers CB, relay contacts R2c and R23c, the brush of emitter SP, its 1 segment, connection sp1, the 1 row of brushes B of the transmitter, the contact bar 14 of column 14 engaged by the row 1 brush of column 14 through the 1 hole in column 14 of card BK, the return brush 34 of this column; thence via connection bb14 to plug socket BB14. From this point, the circuit continues by plugwire to upper socket 14 of section 1A (see Fig. 36) of the auxiliary plugboard, thence to lower companion socket 14 and from there to socket PP14. The circuit is completed through punch magnet PM of column 14, via one of the now-closed contacts of relays R43 to R50 and R53 to R56, to line 366.

Energization of magnet PM of column 14 at the "1" time of the cycle causes column 14 of card T to be punched with a 1 hole, reproducing the hole of column 14 of the book card BK.

In a similar manner, other perforations sensed on the inserted book and borrower cards will be reproduced in card T. It will be noted, however, that for the column of card T selected to designate the loan day by an X hole, the column selected to designate the normal due day, and the column selected to designate the extended due day, the punch circuits differ in this respect: They are routed through columns splits 1, 2, and 3 and the commons, plugged thereto, of the auxiliary plugboard. Thus, with the normal due day selected as 14, the X punching to designate this due day would occur in the date due box 14 which is located in column 61 (see Fig. 19). This same column is to reproduce the 6 hole of the column numbered 61 of the borrower card BR. The circuit to reproduce this 6 hole is made at the "6" time and extends via the emitter SP segment 6, the brush B of column 61 and row 6, the socket BB61, plugwire to the upper socket 14 of section 2A (see Fig. 36), to the upper "common L," the 0—9 socket of column split 2, thence to the now-connected common socket (also see Fig. 37a) of column split 2, the lower "common L" (Fig. 36), the lower socket 14 of section 2A and from there to PP61 and through punch magnet PM of column 61. Similarly, the punch circuits for column 7 selected as the loan day column and column 21 selected as the extended due day column would be routed through column splits 1 and 3 and "common A" and "common E," respectively.

Keys K0, 1, and 5, respectively of key banks 3, 2, and 1 and key K—D of bank 5 have been depressed by the transmitter operator, in the assumed example. As a result, columns 41, 42, and 43 of card T (Fig. 19) will be punched with holes 0, 1, and 4, respectively, and column 80 will be punched with a 4 hole. The circuit for punching column 41 with the 0 hole is completed at the "0" time of the cycle, as follows (Figs. 37c and d): From line 365 via CB, R2c, R23c, the brush of emitter SP, its segment 0, the connection sp—0, the brush holder 16 of row 0, the now-closed key contacts k—0 of bank 3, now-closed JRa contacts, connection kk3 to socket KK3. From this point, the circuit continues to upper socket 6 of section 2A (see Fig. 36) of the auxiliary plugboard, thence to lower companion socket 6, and from there to socket PP41 and through magnet PM of column 41 and via one of the now-closed relay contacts of relays R43 to R50 and R53 to R56 to line 366. Similarly, circuits to cause punching of columns 42 and 43 with the designations of values 1 and 5 selected by keys K1 and K5 of key banks 2 and 1 will be established.

The punch circuit for column 80 will not be routed through the auxiliary plugboard sockets since this column is not adapted to designate a loan day or due day designation. Hence, the circuit prepared by key contacts k—D of bank 5 which is made at the "4" time of the cycle extends from socket KK5 directly to socket PP80 (see Fig. 36). If a key of bank 4 had been depressed, a punch circuit for column 40 would have been routed through column split 5 (0—9 and common sockets) to upper socket 5 of section 2A (see Fig. 36), thence to companion lower socket 5 and to PP40.

The punch circuits to reproduce indicia sensed on the cards BK and BR in the transmitter and to punch values selected by keys K have been explained.

The manner in which the loan day, loan month, and due day designations are punched in selected X positions will now be explained. During the "11" (X) time of the circuit, coils R11 are maintained energized via cam contacts P2 (see Figs. 35 and 37a). These coils shift their relay contacts R11a in the column splits, so as to disconnect the common sockets from the 0—9 sockets and to connect them to the 11—12 sockets. Also, at the X or "11" time, cam contacts P6 close and connect sockets XS to line 365 (see Fig. 37c) via the R2c and CB contacts. With "7" selected as the loan day, a circuit is completed at the "11" time to cause an X to be punched in column 7. This circuit is made from line 365 via CB, R2c, and cam contacts P6 to an XS socket, thence by plugwire (Fig. 36) to the 11—12 socket of column split 1, the now-connected common socket of column split 1, plugwire to lower "common A," lower socket 7 of section 1A, thence to socket PP7 and through punch magnet PM of column 7 and, in the manner indicated before, to line 366. As a result, the X position of column 7 of card T (Fig. 19) is punched to designate loan day "7."

The month-loaned circuit or circuits are completed as follows: From line 365 via CB, R2c, P6, an XS socket, plugwire to the "month-loaned common" (see Fig. 36), thence to the jack-connected one or more of the lower sockets 32 to 35 of section 1A, to the plugged sockets PP32 to 35 and through the connected punch magnets PM. In the example indicated in Figs. 19 and 36, with lower sockets 32 and 33 of section 1A plugged to the "month-loaned common," X holes will be punched in columns 32 and 33, combinationally designating May as the loan month (see Fig. 21).

The selected normal due day is punched when the book card does not have a 2 hole in column 24. When this 2 hole is absent, relay contacts RS4a (see Fig. 37c) remain in normal condition and connect special control sockets SC2 and 8. Socket SC8 is plugged to socket SC9 (see Fig. 36). Socket SC9 is wired to one side of normally closed relay contacts R8a (Fig. 37c), which are connected to socket SC10. As shown in Fig. 36, socket SC10 is plugged to the XS socket bank and socket SC2 is plugged to the 11—12 socket of column split 2. Accordingly, at the "11" time

of the cycle, a circuit (see Figs. 36 and 37c) may be completed from line 365 via CB, R2c, P6, the XS socket, socket SC10, the normally closed contacts R8a, socket SC9, socket SC8, the normally closed side of contacts RS4a, socket SC2, thence via the now-connected 11—12 and common sockets of column split 2 and by plugwire to lower "common L," to the selected lower socket 14 of section 2A to PP61, through punch magnet PM of column 61, and via a closed point of one of the relays R43 to R50 and R53 to R56 to line 366. As a result, should relay RS4 remain unenergized, the selected normal due day 14 would be designated by an X hole in card column 61.

EXTENDED DUE DAY PUNCHING

If the card BK in the transmitter has a 2 hole in column 24, as in the example shown in Fig. 22, the normal due day punching will be suppressed and the extended due day punching will occur. It will be recalled that cam contacts P22 made during the period between "13.6" and "14.1" of the cycle to coact with relay contacts RS3b for closing the circuit of solenoid 0—9, placing return brushes 34 in engagement with contact bars 14 of the transmitter. During this same period of the cycle, cam contacts P15 are closed and the following circuit (Figs. 37c and d) is established, provided a 2 hole is present in column 24: From line 365 via cam contacts P15, connection sp2, brushes B of row 2, the brush of this row engaging column 24 contact bar 14 through a 2 hole in the book card, associated return brush 34, connection bb24 to socket BB24; thence by plugwire to the common socket of column split 6 (Fig. 36), to the now-connected 11—12 socket of this column split, from there to plugged up socket SC6, and via wire 375 through coil RS4P (see Fig. 37a) to line 366. Contacts RS4b close, and coil RS4H is energized via these contacts and cam contacts P2. Relay RS4 shifts contacts RS4a (Fig. 37c), thereby disconnecting socket SC2 from socket SC8 and connecting the socket SC3, instead, to socket SC8. Accordingly, when cam contacts P6 close and at the "11" time of the cycle, a circuit (Figs. 36 and 37c and d) will be completed from line 365 via CB, R2c, P6, the XS socket, plugwire to socket SC10, thence via contacts R8a to socket SC9, by plugwire to socket SC8, then through the now-shifted side of contacts RS4a to socket SC3. The circuit proceeds by plugwire to the 11—12 socket of column split 3 (see Fig. 36), to the now-connected common socket of column split 3, thence by plugwire to lower "common E," lower socket 21 of section 2A, to socket PP68 and through magnet PM of column 68 and, in the manner previously indicated, to line 366. As a result, the extended due day "21" will be designated by an X hole in column 68 of card T (see Fig. 19).

Variable loan period.—When a variable loan period is to be designated, neither the normal nor extended due day will be punched. To suppress such punching, the operator, before actuating the handle of the transmitter, depresses key K—MF which is in key bank 4 (see Figs. 1 and 37d). Accordingly, near the beginning of the card cycle initiated by the operation of the transmitter handle, a circuit will be established from line 365 via P15 (Fig. 37c), the connection sp2, brush carrier 16 of row 2, key contacts k—MF, contacts JRa, connection kk4 to socket KK4. The circuit proceeds via plugwire to the common socket of column split 5 (see Fig. 36), thence to the now-connected 11—12 socket of column split 5, to socket SC5. From this socket, the circuit is completed via wire 376 through coil R8P to line 366 (see Figs. 37a and 37c).

Energized coil R8P closes contacts R8b, completing the circuit of coil R8H through contacts R8b and R23d. The coil R8H will remain energized until coil R23 is deenergized as a result of the re-opening, at the completion of the transaction, of transmitter contacts T4 (see Fig. 37b). Thus, contacts R8a (Fig. 37c) will remain open during the transaction to prevent closure of the X punching circuits, traced before, for the normal and extended due days. During the 0 to 9 period of the cycle, the 0—9 and common sockets of the column splits are connected. Hence, with key contacts k—MF closed, a circuit will be completed at the "2" time, extending via the emitter SP and, as indicated previously in the tracing of key circuits, via the key contacts k—MF and contacts JRa to socket KK4, the plugwire to the common socket of column split 5 (see Fig. 36), to the now-connected 0—9 socket of column split 5, by plugwire to upper socket 5 of section 2A, thence to lower socket 5, to socket PP40, and through magnet PM of column 40. Thus, a 2 hole will be punched in column 40 of card T. This will classify the value selected by keys of key banks 3, 2, and 1 and punched in columns 41, 42, and 43 as a key selected, special loan period.

The punching of a card T for a loan transaction has been explained.

A RETURN TRANSACTION

The circuits for a return transaction will now be explained. When a return transaction is to be made, the transmitter operator inserts a book card but does not insert a borrower card. In place of the borrower card, the return check card RC (Figs. 7 and 8) is inserted and its tab 70 closes contacts TC1. Closure of these contacts completes a circuit (see Figs. 37a and b) from plus connection N1 via transmitter contacts T4 and the contacts TC1 to connection N45 and through a coil RS8 to line 366. Coil RS8 shifts contacts RS8b (Fig. 37c) to cause relay coils R51 and R52, instead of R43 to R50 and R53 to R56, to be energized during the closure period of cam contacts P12. With coils R51 and R52 energized, they close relay contacts in the circuits of the punch magnets for columns 47 to 58 which is the return transaction field of columns (see Figs. 19 and 20). With coils R43 to R50 and R53 to R56 not energized during the return transaction, the punch circuits for card columns other than those in the return field cannot be established.

Coil RS8, when energized, also shifts contacts RS8a in the previously traced circuit of transmission-enabling coil RS3P (Fig. 37a). The circuit of coil RS3P will then be able to make only through the shifted side of contacts RS8a and a pair of normally closed RS2a contacts. The latter contacts will remain closed unless a previously punched return card is at the punching station when a return transaction is to be made. For the present, assume that the card fed to the punches is a blank card T, so that contacts RS2a remain closed. A card cycle is initiated in the same manner as during a loan transaction. Neither loan day, loan month, or due day designations will be punched because the punch magnets for the columns in which these designations may be punched have been disconnected from

line 366. The punch circuits selected by keys of banks 3, 2, and 1 will be made through punch magnets PM of columns 55, 56, and 57. Such circuits will extend through paths including plugwires between sockets KK3, 2, 1 and sockets PP55, 56, 57 (see Fig. 36). The punch circuit selected by a key of bank 4 will extend from socket KK4 via the common and 0—9 sockets of columns split 5 to socket PP54. The key-selected value classification designation will thereby be punched in column 54. The book number sensed on the inserted book card will be punched in columns 47 to 53 (see Fig. 20). To punch the part of the book number in return columns 47 to 52, sockets BB8—13 are plugged to sockets PP47—52, as indicated in Fig. 36. The punch circuit for column 53 is routed through column split 7 and extends from socket BB14 by plugwire to the 0—9 socket of column split 7 and from the common socket thereof to socket PP53. The reason for routing this circuit through a column split is because it is desired to punch an X hole in column 53 if the card under the punches is a previously punched return card at the time the return transaction is attempted. This will be explained further on under the next heading.

To provide for identification of a card punched during a return transaction as a return card, an X hole will be punched in column 58. The clerk's code number 0 to 9 selected by key bank 5 is also to be punched, during a return transaction, in column 58. Accordingly, the punch circuit selected by a key of bank 5 is routed, during a return transaction, through the 0—9 and common sockets of column split 4 (see Fig. 36). The circuit for punching the X hole in column 58 is made from line 365 via contacts CB, R2c, and P6 (Fig. 37c), to an XS socket, plugwire to socket 11—12 of column split 4 (see Fig. 36), to the then-connected common socket of this column split, and from there to socket PP58, through column 58 magnet PM, and via one of the *a* points of relays R51 and R52 to line 366.

The manner in which a blank card T is punched with a return transaction has been explained.

By-Passing a Previously Punched Return Card

As previously stated, previously punched return cards are mingled with blank cards in the supply hopper PH. These previously punched return cards are usable only to record a new loan transaction and are obviously not usable to record another return transaction. It may happen, however, that such previously punched return card has been fed to the punching station in readiness to record a loan transaction but that, fortuitously, a return transaction is set up by the transmitter. In such case, the previously punched return card will be by-passed; that is, will be fed past the punching station without recording a transaction, and card feed will continue automatically until a blank card reaches the punching station in readiness to record the desired return transaction. Since each return card has an X hole in column 58, such identification is utilized to control means to recognize the presence of a re-used return card at the punching station and to cause this card to be by-passed in the event a new return transaction is to be transmitted. The means for detecting the arrival of a previously punched return card at the punching station includes the PX brush (Fig. 24) which is adjusted to sense card column 58. During the cycle pertaining to a transaction, while one card is being punched with a record of this transaction, the following card is being fed from the supply hopper, and the X position of column 58 of this following card arrives under the brush PX near the end of the cycle. If such following card is a previously punched return card, it has an X perforation in column 58. Accordingly, upon closure of cam contacts P3, a circuit (see Fig. 37*a*) will be established from line 365 via P3, R1*b*, common contact bar 221, the PX brush sensing the X perforation in column 58, brush socket PXS, a plugwire to socket SX (see Fig. 36), and through relay coil RS2P to line 366. Contacts RS2*b* close and the circuit of RS2H is made via cam contacts P4, now-closed relay contacts R2*b* and contacts RS2*b*, and through coil RS2H to line 366. This circuit which makes near the end of a card cycle pertaining to one transaction recorded on the preceding card, holds over into the next card cycle to be initiated for recording of the next transaction. Contacts RS2*a* in the circuit of transmission-enabling coil RS3P (Fig. 37*a*) open so that this circuit can be made during such next card cycle only through the normally closed side of contacts RS8*a*. As explained before, return relay RS8 is not energized during a loan transaction and contacts RS8*a* remain in normal condition. Hence, if such next card cycle has been initiated to record a loan transaction, the circuit of RS3P will make as previously explained and the re-used return card will be punched again, but this time with loan transaction data. On the other hand, if the said next cycle is initiated to record a new return transaction, relay RS8 will be energized, contacts RS8*a* will be shifted, and with the contacts RS2*a* also open, the circuit of coil RS3P will not make. Contacts RS3*b* (Fig. 37*a*) will not close, so that solenoids X—R, 0—9, and coils JR (Fig. 37*b*) will not be energized. Hence, the circuit paths to all the BB and KK sockets will remain open, and neither the key-selected return data nor the data sensed on the inserted book card will be transmitted to the recorder. The previously punched return card will, therefore, be fed through the punching station without being punched with the new return transaction.

To distinguish between such by-passed previously punched return cards and the return cards punched with current return transactions, each by-passing return card is punched in column 53 with an X hole. Thus, all return cards punched with an X hole in column 53 and with an X hole in column 58 will be identified as by-passed return cards while return cards punched only in column 58 with an X hole will be identified as current return cards. To provide for punching a by-passing return card with an X hole in column 53, column split 7 has its common socket plugged to punch magnet socket PP53 (see Fig. 36) and its 11—12 socket plugged to special control socket SC7. As shown in Fig. 37*c*, socket SC7 is associated with socket SC4 by normally open contacts RS2*c*. As explained above, relay RS2 has been energized as a result of the detection of a previously punched return card at the punching station. Punching may occur in column 53 only if a return transaction is to be made. This is because only then will coil RS8 be energized and contacts RS8*b* shifted to enable relays R51 and R52 (Fig. 37*c*) to be energized. These relays close contacts between punch magnets PM of columns

47 to 53 and line 366. Thus, the following circuit can be made only if a return transaction has been set up by the transmitter and a previously punched return card has been fed to the punching circuit. The said circuit makes, at the "11" time, from line 365 via contacts CB, R2c, P6, an XS socket, plugwire to socket SC4 (see Fig. 36), thence via now-closed relay contacts RS2c (see Fig. 37c) to socket SC7, and by way of the now-connected 11—12 and common sockets of column split 7 and plugwire to socket PP53 (see Fig. 36). The circuit is completed from this socket through magnet PM of column 53 and via one of the now-closed a contacts of relays R51 and R52 to line 366. Energization of magnet PM of column 53 at this time causes an X hole to be punched in column 53 of the previously punched return card. This card will thereby be distinguished from current return cards. The manner in which card feed continues automatically to eject the previously punched return card from the punching station and feed a blank card into position to be punched with the return transaction set up by the transmitter will be made clear in connection with the following description.

Terminating a Card Cycle

Near the end of a card cycle, after a card T has been punched with transmitted information, cam contacts P18 close (see Fig. 35). Since information has been transmitted and punched during the card cycle, coil RS3P has been energized and coil RS3H is being maintained in energized condition via cam contacts P19 and relay contacts RS3a. Thus, coil RS3H is still energized at the time cam contacts P18 close during the same card cycle. Hence, relay contacts RS3c (Fig. 27c) are closed when cam contacts P18 close and a circuit is completed from line 365 via P18 and RS3c and, via wire 377, through coils RS5P and RS6P in parallel (Fig. 37a), to line 366. Coil RS5P closes contacts RS5a to establish a circuit for coil RS5H from line 365 via now-closed relay contacts R9b (Fig. 37a) and RS5a through coil RS5H to line 366. Coil RS6P closes contacts RS6c to complete a circuit from plus connection N1, via the still-closed transmitter contacts T4 (Fig. 37b), to connection N4, thence via contacts RS6c through hold coil RS6H to line 366.

Relay RS6 opens contacts RS6a and RS6b to break the circuits of relays R23 and R10 (Fig. 37a). Upon deenergization of R10, contacts R10c open, breaking the circuit of clutch magnet PCM (Fig. 37a). The card feed means will therefore stop at the end of the one card cycle initiated by operation of the transmitter handle 83. The opening of contacts R10b breaks the pick up circuit of relays HD and R9 but these remain held through stick contacts R9a and cam contacts CR until shortly after "1" of the next machine cycle (see Fig. 35). When relay RS5 was energized, it closed contacts RS5b and upon subsequent closure of cam contacts P11 (see Figs. 35 and 37a), a circuit is completed as follows: From plus connection N1 (also see Fig. 37b) to connection N13, thence via contacts P11, contacts RS5b, the normally closed relay contacts R37b to connection N39 and through restoring solenoid RS to minus bus 372.

Solenoid RS (see Figs. 2 and 3), in the manner explained before, releases latch lever 108 from arm 113 of transmitter shaft 28 and also causes release of depressed keys K in key banks of which the key lock levers 150 have been placed in their forward or release positions (see Fig. 2). The transmitter shaft and the parts operated thereby now return to home positions. Contacts T4 open, breaking the circuit of coil RS6H.

Cam contacts CR open during the machine cycle following the one in which RS5 relay was picked up. When the contacts CR open, relays HD and R9 are deenergized. Switch HD1 opens to break the motor DM circuit. Contacts R9b open, breaking the circuit of RS5H. All the parts are now in initial condition.

The manner in which the card cycle which has been initiated to cause recording of a transaction is terminated and operation of the recorder interrupted at the completion of the transaction has been explained. It is evident, now, that relay RS3 (Fig. 37a) must have been energized and its contacts RS3c (Fig. 37c) closed to enable the operation terminating relays RS5 and RS6 (Fig. 37a) to be energized. Energization of relay RS3, however, takes place only when a transaction is transmitted to the recorder and punched in a card. As explained before under the heading "By-passing a previously punched return card," when a return transaction has been set up and a previously punched return card is at the punching station, relay RS3 will not be energized. The new return transaction will not be transmitted to the recorder during the card cycle initiated by the transmitter. Further, since contacts RS3c will not have closed, the operation terminating relays RS5 and RS6 will not be energized. Accordingly, restoring solenoid RS will not be energized, and relays R23, R10, R9 and HD will remain energized. The recorder, therefore, will continue automatically to perform an additional card cycle to feed the card following the previously punched return card to the punching station. If such following card is a blank card, the new return transaction will be recorded thereon. If such following card or cards are also previously punched return cards, the recorder will continue automatically to feed cards until a blank card arrives at the punching station and then feeds through this station and is punched with the new return transaction. It will be clear that as each bypassed return card feeds through the punching section, it will be punched, in the manner explained before, with an X hole in column 53.

Checking Book and Borrower Cards

Means are provided to check the book and borrower cards inserted in the transmitter to determine whether their respective book and borrower fields are properly punched. Either of these fields is considered faulty, in the present use of the invention, when any one of the columns of these fields has more than one perforation or is devoid of any perforation. It should be noted that columns preceding the column of a field bearing the first significant digit are punched with 0 holes. If the book field of an inserted book card BK for the borrower field of an inserted borrower card BR is faulty, the transmitter handle will not be released for a new transaction and the card T punched with the transaction including data derived from the faulty inserted card in the transmitter will be marked with an error indication. Further, the card preceding the unwanted card T will be offset and this will indicate the location of the unwanted card.

To prepare the recorder to check the desired columns of the inserted record material, sockets BB8—14 (relating to the book field) are plugged to sockets DD14—20 and sockets BB59—64 (re-

lated to the borrower field) are plugged to sockets DD8—13 (see Fig. 36).

To prepare the recorder to check the book and borrower fields for blank columns, the operator closes those individual switches DS (Fig. 37c) which have the same numbers as the numbers of the sockets DD which are plugged to BB sockets.

The checking of the book and borrower fields takes place during transmission of data derived from these fields while a transaction is being performed. Assume, for example, that column 8 of the inserted book card BK has a 0 perforation. During the card cycle, when the brush of emitter SP engages the 0 emitter segment, a punch circuit, such as previously traced, is established to cause the 0 hole of column 8 of the book card to be reproduced in a column of card T. During a loan transaction, this punch circuit is routed from socket BB8 by plugwire to upper socket 8 of section 1A of the auxiliary plugboard (Fig. 36) and from there, in the manner explained before, to PP8 and through magnet PM of column 8. If a return transaction is being effected, the punch circuit is made via plugwire from socket BB8 to socket PP47 to cause energization of magnet PM of column 47 to reproduce the 0 hole sensed in column 8 of card BK. Concurrently with the making of the punch circuit, a first checking circuit is completed. This checking circuit begins the same as the punching circuit but branches by plugwire from socket BB8 to socket DD14, thence via the normally closed side of transfer contacts DF14*a* (Fig. 37c) and through a coil D14 to line 366. Coil D14 closes contacts D14*a*, and a stick circuit is established from line 365 via cam contacts P19 and P20 and contacts D14*a* through coils DF14 and D14 to line 366. This circuit is held until "13" of the card cycle, at which time the cam contacts P19 open. Coil DF14 now shifts contacts DF14*a*, thereby connecting socket DD14 to a common line 385. Should a second perforation be sensed in column 8 of the book field, a second checking circuit will be completed concurrently with the completion of a second punch circuit under control of the second perforation in column 8 of the book field. This second checking circuit proceeds from socket BB8 by plugwire to socket DD14, thence via the now-shifted side of contacts DF14*a* to line 385 from which the circuit is completed through a switch 386 and coil R87P to line 366. Contacts R87c close and a circuit (see Fig. 37c) is made from line 366 via the normally closed side of cancel relay contacts RS7*a* and a key switch 387 through contacts R87c and coil R87H to line 366. A shunt circuit is completed through a signal lamp SL located at the recorder end to notify the recorder operator that a faulty card or cards has been inserted in the transmitter. A second shunt circuit extends from contacts R87c via a wire 388 to connection N36 (Figs. 37*a* and *b*), thence through red signal lamp RD, of the transmitter, to minus bus 372. The lighting of lamp RD notifies the transmitter operator that the inserted book or borrower card or both are faulty. A third shunt circuit (Fig. 37c) branches from contacts R87c via a wire 389 and a switch 390 through a relay coil R26 to line 366.

If any one of the columns of the book or borrower fields of inserted cards is not found to have a perforation, then a punching circuit and a first checking circuit will not be completed under control of this column during the punching circuit. As a result, the DF and D coils associated with the first checking circuit for this blank column will not be energized. For instance, if book number column 8 is blank, coils DF14 and D14 will not be energized. Accordingly, the contacts D14*b*, in series with switch DS14 of the blank column detection network will remain closed. Then, when cam contacts P18 close during the "9" cycle time, a circuit will be established as follows (Fig. 37c): From line 365 via P18, now-closed RS3c contacts, switch DS14, contacts D14*b*, and, in parallel, through coil R26, coil R87H, recorder, warning signal SL and transmitter, warning signal RD (Fig. 37*b*) and back to line 366 by the paths traced before. Contacts R87c close and the stick circuits of coils R26 and R87H and of signal lamps SL and RD are completed via relay contacts RS7*a* and the key contacts 387.

With relay coil R87H energized as a result of a faulty book or borrower number column having been detected, contacts R87*a* (Fig. 37*a*) open to prevent re-making of a circuit through start relay R10. Further, contacts R87*b* (Fig. 37*a*) open, preventing the circuit of restoring solenoid RS (Fig. 37) from being made, so that the transmitter handle 83 and parts operated thereby remain latched down. The transmitter operator, however, may remove the book or borrower card or both and examine them for errors.

The card T punched under control of the faulty record material detected in the transmitter is to be discarded; that is, the transaction recorded therein is to be considered as though cancelled and, hence, the card is an unwanted card. One indication of the unwanted card is provided by offsetting the preceding card by means previously described and shown in Figs. 33 and 34. During the cycle in which the unwanted card was punched, the preceding card fed into the printing station. Towards the end of this cycle, cam contacts P10 (Fig. 37c) close and, with contacts R26*a* now closed, a circuit is completed through pick-up coil R27P. Contacts R27*a* close and a circuit is completed from line 365 (Fig. 37*a*) via cam contacts P4, a wire 392 (also see Fig. 37c), and thence, via R27*a* contacts, through coil R27H to line 366. This circuit holds over into the first following cycle. During this first following cycle, the said preceding card is moved to the eject members 250 (see Fig. 24), ready to be completely ejected shortly after the beginning of the second following cycle. Near the end of the first following cycle, cam contacts P23 close and with relay contacts R27*b* closed, a circuit (Fig. 37c) is completed through offsetting control magnet OM. Energization of magnet OM unlatches the levers 360 and 360*a* (Fig. 34) which now remain in unlatched condition until they are subsequently restored by cam 263 of the eject shaft 251. During the second following cycle, cam 262 coacts with lever 260*a* and the shaft 251 is moved axially to the right (Fig. 33) as the eject sectors 250 engage said preceding card to complete its ejection. As a result, this preceding card is laterally offset. Shortly after the offsetting operation occurs, restoring cam 263 restores the levers 260 and 260*a* to normal, latched positions. When the cards are removed from the delivery pocket PS, the card following an offset card is known to be an unwanted card. Further, an error indication will be made directly on the unwanted card, as will be explained later.

It will be noted that the sockets DD8—13 are plugged to sockets BB59—64 (see Fig. 36) which pertain to the borrower number field. The blank

column detection circuits for the borrower number field are routed through normally closed relay contacts RS8*d*. It will be remembered that relay RS8 (see Fig. 37*a*) is energized whenever a return transaction is taking place and its energization is controlled by closure of contacts TC1 (Fig. 37*b*) upon insertion of return check card RC in place of a borrower card. Since a borrower card is not present in the transmitter during a return transaction, the brushes B of columns 59 to 64 will apparently sense blank columns of the return check card and cause apparent detection of a faulty borrower number field. Such apparent detection during a return transaction is prevented by the opening of relay contacts RS8*d*.

To release the transmitter for a next transaction following the faulty transaction, the transmitter operator depresses the cancel key K—C which is in the key bank 4. A circuit is thereupon established from plus connection N1 via a wire 393 (Figs. 37*b* and 37*d*), cancel key contacts *k*—C, a wire 394 and connection N40 through relay RS7 (Fig. 37*a*) to line 366. Contacts RS7*a* (Fig. 37*c*) now shift and break the circuits of coils R26 and R27H and of signal lamps RD and SL. Upon deenergization of R27H, contacts R27*b* reclose and with cancel relay contacts RS7*b* also closed, a circuit (Fig. 37*a*) is completed from line 366 via RS7*b*, now-closed contacts R27*b*, connection N39, and through restoring solenoid RS (Fig. 37*b*) to minus bus 372. Energization of solenoid RS releases the transmitter for operation to transmit a new transaction.

When relay contacts RS7*a* shifted, they closed a circuit through relay coil R27P independently of the parallel circuit which may be closed via R26*a* contacts. The purpose of thus closing the circuit of coil R27P through the shifted relay contacts RS7*a* is to enable operation of the cancel key to cancel a transaction independently of whether the inserted record material in the transmitter is faulty or not. The card T which has just traversed the punching station will be indicated as the unwanted card if the cancel key is depressed at the end of the cycle in which this card is punched but before initiation of the next cycle.

Printing Operations

At the end of a card cycle in which a card has traversed the punching station, the leading edge of the card is just past the brushes PB and card lever contacts PCL are closed. Contacts PCL, upon closure, cause energization of relay R7 (Fig. 37*a*). Contacts R7*a* close and, in the operation of the recorder when disconnected from the transmitter, closure of these contacts would form a stick circuit for relay R10 which would keep the recorder running through continuous successive card cycles. However, with the recorder connected to the transmitter, relay R22 has been energized and contacts R22*a* shifted to prevent closure of contacts R7*a* from completing a stick circuit for relay R10. In this way, except for cycles initiated by the start key and the exception noted in the section "By-passing a previously punched return card," the recorder is constrained to perform one cycle at a time, each cycle initiated by the transmitter, to record a transaction. During the card cycle following the punching of a card, the card will be fed past the brushes PB and into the printing station at which typewheels 280 are located. In the next card cycle, the card will be printed on and then fed past the printing station, following which the card will be ejected into magazine PS.

It is desired to print an interpretation of the book number which has been punched in columns 8 to 14 of a card T (Fig. 19) as a result of a loan transaction. A return transaction will be recorded simply by punching columns 47 to 58 of a card (see Fig. 20) and none of these columns will be interpreted. To determine which card columns are to be interpreted, desired sensing brushes PB (Fig. 37*c*) have their connected plug sockets PBS plugwired to the appropriate interpreting order plug sockets IMS (Fig. 37*e*). In the present illustrative example, the sockets PBS of columns 8 to 14 are plugged up to the sockets IMS—8, 7, 5, 4, 3, 2, and 1, respectively (see Fig. 36). As a result, the book number designations of a card T bearing loan data will be interpreted and printed in a left hand area of the card (see Fig. 19). The types 5, 1, 6, 2, 7, 3, 8, 4, 9, and 0 of each type wheel 280 (see Fig. 27) pass the printing position, at which platen 340 is located, during the latter portion of a cycle. On the other hand, the index positions 1 to 4 of a card are sensed in the early part of a cycle. Accordingly, means are provided to store sensed values 1 to 4 and to control setting up of types 1 to 4 by the storage means. For this purpose, an emitter EP (Fig. 37*e*) has four read-in segments 1 to 4 and four related 1 to 4 readout segments plus an additional 0 readout segment. The brush of emitter EP will wipe read-in segments 1 to 4 synchronously with sensing of index positions 1 to 4 and will wipe readout segments 1 to 4 synchronously with travel of types 1 to 4 to the printing position. The 0 segment will be wiped as the 0 types approach printing position.

When lever contacts PCL closed to energize relay coil R7, coil R77P (Fig. 37*a*) also was energized. Contacts R77*a* and *b* closed and coil R77H (Fig. 37*e*) was energized by a circuit extending from line 366 (Fig. 37*a*), via cam contacts P4, wire 392 (Figs. 37*c* and 37*e*), and contacts R77*a* and R77*b*, through coil R77H.

Assume the card moving past brushes PB is a card with loan data and is punched in columns 8 to 14 to represent borrowed book number 5 2571. During the "1" sensing time, a circuit makes from line 365 (Fig. 37*a*), via cam contacts P4, wire 392, contacts R77*a* and R77*c* and circuit breakers CBP (Fig. 37*e*) to the brush of emitter EP; thence via the 1 read-in segment and through coils J33 and J34 to line 366. The relay contacts of these coils in the several orders 1 to 8 of the printing control network close. During the "1" sensing time, the "1" perforation in column 14 is sensed and a brush circuit is completed as follows (Fig. 37*c*): From line 365 via CB, R7*a*, contact roll PCR, column 14 brush PB, plugwire connection to socket IMS1 (see Fig. 36), the normally closed side of contacts J44—1 (see Fig. 37*e*), contacts J34—1, and through storage relay coil J29P to line 366.

Contacts J29*a* close and storage relay J29H (Fig. 37*e*) is energized by way of cam contacts P9.

During the "2" sensing time, by a circuit such as traced, emitter EP causes coils J35 and J36 to be energized. Contacts J36—4 close and a brush circuit is established by the sensing of the "2" hole in card column 11 through a coil J18P. Contacts J18*a* close and storage relay J18H is energized. In a similar manner, other storage relays would be operated as a result of sensing of

"3" and "4" holes. After the "4" sensing time and before the "5" sensing time, cam contacts P8 close and a circuit is completed via cam contacts P4 (Fig. 37a), wire 392, contacts R77a and c (Fig. 37e), and cam contacts P8 through coils J43 and J44 to line 366. The several J43 and J44 contacts in the orders of the printing control network shift to prepare magnets IM for energization in direct response to impulses resulting from the sensing of holes "5" to "9" in the card.

In the second half of the "5" cycle division, the brush of emitter EP wipes the 1 readout segment. Storage relay J29H has been energized and contacts J29—2 are shifted. Accordingly, a circuit forms from line 365 via P4 (Fig. 37a), wire 392, R77a and c, CBP, the emitter brush, the 1 readout segment, the now-closed shifted side of contacts J29—2, and through the magnet IM1 to line 366. Energization of the magnet IM1 at this time results in stopping of the related units order typewheel 290 with its "1" type at printing position. Similarly, the magnet IM4 will be energized during the latter half of the "6" cycle point with the type "2" at printing position, the circuit for this magnet IM being made via the 2 readout segment of emitter EP, shifted storage relay contacts J18—2 and the unshifted storage relay contacts J17—2 which relate to a 1 value in the "4" order. Thus, if value 1 had been stored, J17—2 would be open, preventing a 2 value from being printed in the same order. Likewise, values 3 and 4 may be printed only if lower values had not been set up in the same order. The typewheels would be arrested with "3" and "4" types at printing position during the second half of each of cycle points "7" and "8" if the values 3 and 4 had been sensed by brushes PB. During the first half of each of cycle points "5," "6," "7," "8," and "9," the magnets IM may be energized directly as a result of the sensing of perforations "5" to "9" by brushes PB so as to arrest typewheels with their types "5" to "9" at printing position. Thus, in the assumed example, card column 9 has a 5 perforation and a circuit is made from line 365 (see Fig. 37c) via CB, R1a, roll PCR, column 9 brush PB, plugwire connection to IMS7 socket (Fig. 36), the now-closed shifted side of contacts J43—3, in series via the normally closed sides of the storage relay contacts of the 7th printing order, and through magnet IM of this order to line 366. Energization of IM at this time arrests the related typewheel with its 5 type in printing position. Similarly, the sensing of the 5 hole in column 12 causes magnet IM of the 3rd order to be energized to cause the 5 type of this order to be stopped in printing position. The sensing of the 7 hole in column 13 during the first half of the "7" cycle point causes the 2nd order typewheel to be arrested with the "7" type in printing position. To prepare for the possible printing of zeros in orders "7" and "4" to "1," switches ZP of these orders are preliminarily closed. Cam contacts P7 close within the "9" cycle division to energize relays J41 and J42 (Fig. 37e) which shift their related contacts in the several printing order networks. While these contacts are thus shifted, the brush of emitter EP wipes the 0 readout segment and zero impulses are transmitted to the magnets IM of those orders in which switches ZP have been closed. For example, the zero impulse circuit for the 1st order will extend from the 0 readout segment of emitter EP via the switch ZP of this order, the shifted contacts J42—1, the storage relay contacts, when in unshifted condition, of this order, and through magnet IM—1 to line 366.

If any of these orders receiving a zero impulse has already been stopped with a significant digit type 1 to 9 in printing position, the zero impulse will have no effect. The zero impulse also will be ineffective if a higher order in the same set of orders has not been arrested with a significant digit type at printing position. As previously explained, the type wheels have been separated into two sets by omitting the finger 326 (see Fig. 27) of the zero pawl 318 of the 6th order. Thus, the setting of the 6th order wheel or the 7th or 8th order wheels to any positions will have no effect on the lower orders and, as a result, the type wheels are divided into one set comprising the 8th, 7th, and 6th orders and a second set comprising the 5th to 1st orders. Zero switches ZP of the 8th, 6th and 5th orders are left open so that zero will not be printed in these orders. This explains the absence of a 0 imprint preceding the 5 printed under control of column 9 and the absence of a 0 imprint preceding the 2 printed under control of column 11 of the card shown in Fig. 19.

By the end of the card cycle in which the card T has been sensed by brushes PB, the typewheels have all been set to print the designated book number. The printing operation occurs at the "11.5" time of the next cycle while the card is at rest between steps of feed. At the "11" time, the cam contacts P11 (Fig. 37e) close, and a circuit is established extending via contacts R77a and cam contacts P11 through platen operating magnets PLM. Energization of these magnets causes platen 340 (see Fig. 26) to be depressed for causing an imprint to be made on the card in the manner previously described.

It should be noted that unless a card feeds to the PB sensing station, relay R77 is not energized and, consequently, the circuits of the storage relays, the brush circuits, and the circuits of magnets IM and of PLM will not be established. However, if a card feeds to and past this sensing station and there is no card following, relay coil R77H will remain energized until after the printing time of the next cycle, as is desired.

Printing an Error Indicium

As described under the heading "Checking book and borrower cards," relay coil R27P (Fig. 37c) is picked up at the end of a cycle in which an unwanted card has been punched and hold coil R27H is energized, through R27a contacts and cam contacts P4. Energization of relay R27 has resulted either from detection of a faulty book or borrower card or, independently, as a result of depression of the cancel key and consequent shifting of relay contacts RS7a. During the ensuing cycle, the relay R27H remains energized until cam contacts P4 open. Contacts R27b, therefore, are closed while the unwanted card is traversing the brushes PB. At the "1" time of this ensuing cycle, the emitter EP causes energization of coils J33 and J34, as previously explained. With socket SC1 plugged to socket IT6 (see Fig. 36), a circuit is completed as follows (Fig. 37c): From line 365 via now-closed contacts R27c, socket SC1, plugwire to socket IMS6 (see Figs. 36 and 37e), the normally closed side of contacts J43—2, contacts J33—2 and through relay coil J9P to line 366. Contacts J9a close, causing energization of coil J9H. In the manner indicated before, the energization of relay J9 causes storage relay contacts J9—2 to be shifted

so that the magnet IM of the 6th order will be energized during the latter part of the "5" cycle point. As a result, the type 1 of the 6th order will be set in printing position. During the following cycle, when the book number is printed on the unwanted card T, the error indicium 1 also will be printed thereon. This character printed in the position indicated in Fig. 19 denotes that the card is an unwanted card.

It will be noted that the error indicium is printed by an order of the printing assembly of which all the other orders are used to print a book number on a card bearing the data of a loan transaction. It is evident, therefore, that there is no special, additional printing mechanism needed to print the error indicium, as would be the case were a more descriptive symbol such as "V" or a word such as "Void" to be used as an error indicium. Of course, the type "V" might be substituted for the type "1" on the 6th order type wheel, but it is preferred not to do this, in order that this wheel, in addition to the other wheels, be available for printing numeral 1 as well as other numerals when the recorder is used merely as a card interpreter, a use to which it may manifestly be put, as indicated in the aforementioned application Ser. No. 434,773 of G. F. Daly.

Buzzer Signal

When the supply of cards runs low, mercury switch HMS (Fig. 28) closes and when the stack of cards on stacker plate 249 approaches its limit, mercury switch PMS (Fig. 29) closes, as previously explained. Referring to Figs. 37*a* and 37*b*, when either of these switches closes, a circuit is completed from plus connection N1 via connection N38, via either switch HMS or PMS, and through buzzer signal magnet BZM, to line 366.

The buzzer signal warns the operator at the recorder end that either the supply of cards is low or that the delivery pocket is nearly full.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A data transmitting and reproducing apparatus in which a transmitter electrically controls a remote reproducer, said transmitter including a pocket to receive insertable record material and also including a keyboard to set up supplemental data, sensing devices in the transmitter to sense the record material for record data, an operating handle, actuating means operated by the handle for bringing the sensing devices into sensing coaction with the record data, said reproducer being cyclically operable and including recording devices to record selected data, electrical selectors for controlling the recording devices to record selected data, circuits for operating the electrical selectors and selected for operation under control of the sensing devices and the keyboard according to the sensed record data and the supplemental data set-up, an emitter in the reproducer to impulse said circuits successively during a cycle, electrical relay means operated under control of said actuating means, contacts controlled by said relay means for initiating a cycle of the reproducer, and other contacts controlled by the relay means for enabling the selected circuits to be closed successively under control of said emitter for selectively operating said electrical selectors to cause the recording devices to record the record data and the supplemental data upon a single record card during a single, initiated cycle of the reproducer.

2. A data transmitting and reproducing system in which a transmitter electrically controls a remote reproducer, said transmitter including a pocket to receive insertable record material and sensing devices to sense the inserted record material for record data, said transmitter also including a keyboard to select supplemental data, said reproducer including recording means operable during a cycle of the reproducer to record selected data upon a record card in successive recording steps, control circuits for the recording means to transmit the record data and supplemental data to the recording means to be recorded thereby on the record card during said cycle, an electrical emitter means operating during said cycle to complete said control circuits during successive cyclic steps to cause the transmitted data to be recorded step by step upon the record card during said cycle, an operating handle for the transmitter, a transmission-enabling relay operated under control of said handle, and means controlled by said transmission-enabling relay to enable the said circuits to transmit to the recording means sections of both supplemental data and the record data during each said recording step.

3. A data transmitting and reproducing apparatus comprising a transmitter with devices to sense record material for data pertaining to one or another kind of transaction, a manually operable device in the transmitter operable to differentiate one kind of transaction from another, a reproducer including recording means to record the data in one or another of different fields of a record medium according to the kind of transaction, circuits controlled by the sensing devices for selectively controlling the recording means to record the sensed data, and means under control of said manually operable device for selecting the field of the record medium in which the recording means, under control of said circuits, is to record the sensed record data.

4. A data transmitting and recording system in which a transmitter unit electrically controls a reproducer unit, said transmitter unit including means to receive a plurality of insertable records when one kind of transaction is to be performed and to receive, in place of one of said records, an insertable member when another kind of transaction is to be performed, contacts operated by insertion of said member, sensing devices to sense the inserted record or records, said reproducer including means to record the sensed data in one or another of different fields of a record medium, circuits controlled by the sensing devices for transmitting the sensed data and controlling the recording means to record said data, and means under control of said contacts for causing the recording means, under control of said circuits, to record the sensed and transmitted data in the field of the record medium appropriate to the kind of transaction being performed.

5. A transmitting and reproducing system in which a transmitter electrically controls a remote reproducer, said transmitter including devices to sense record material for data pertaining to one or another kind of transaction and also

including means operable to differentiate one kind of transaction from another kind of transaction, said reproducer being cyclically operable and including perforating means to perforate a record medium with data designating perforations, circuits controlled by the sensing devices for transmitting the sensed data and controlling the perforating means, during a cycle of the reproducer, to perforate the record medium with perforations designating said data, means controlled by the transmitter for initiating a cycle of the reproducer for each transaction and during which said cycle the perforating means perforates the record medium according to the sensed data, and means brought into operation under control of the kind-of-transaction differentiating means of the transmitter for causing the reproducer to identify the perforated record made on the record medium as pertaining to one said kind of transaction.

6. A transmitting and reproducing system comprising a transmitter including devices to sense record material for data pertaining to one or another kind of transaction and including kind-of-transaction differentiating means, said reproducer being cyclically operable and including perforating elements to perforate a record card with data designations, circuits controlled by the sensing devices for controlling operation of the perforating elements to perforate one field or another of the record card, during a cycle of the reproducer, with designations of the sensed data, means in the transmitter operable for each transaction to initiate a cycle of the reproducer, and means under control of said kind-of-transaction differentiating means for causing the perforating elements to perforate one or another field of the record card with the sensed data designating perforations depending on the kind of transaction being performed.

7. A transmitting and reproducing system in which a transmitter unit electrically controls a remote reproducer, said transmitter unit having means to analyze record material for data designated thereon and pertaining to one or another kind of transaction, a kind-of-transaction differentiating device in the transmitter, operating means for the transmitter to cause the analyzing means to analyze the record material for the data designated thereon, said reproducer being cyclically operable and including means to perforate data designations in one or another set of columns of a record card, circuits controlled by the sensing device during a cycle of the reproducer for controlling the perforating means to perforate the record card with designations reproducing the analyzed record data designations, means under control of said kind-of-transaction differentiating device for further controlling said circuits to cause the data reproducing perforations to be punched in the record card columns pertaining to one said kind of transaction, and means controlled by said operating means for initiating a cycle of the reproducer for each transaction.

8. A data transmitting unit including a pocket into which record material may be inserted, said record material having data designating perforations in index positions chosen from rows of such positions, electrical means to search the record material for perforations and including a plurality of rows of sensing brushes, one row of brushes for each row of index positions, movable supporting means supporting said brushes normally clear of the pocket to permit the record material to be freely inserted in the pocket, a manual operating device, a shaft turned thereby, and means operated by the shaft, when turned, for moving said supporting means to shift the brushes of all the rows concurrently towards the pocket to engage each row of brushes with the corresponding row of index positions so as to sense all said positions of the record material concurrently for perforations.

9. A data transmitting unit including a pocket into which record material is manually insertable, said record material having data designating perforations in index positions chosen from lines of such positions, electrical means to search the record material in the pocket for perforations and including lines of yieldable sensing contacts, one line of contacts for each line of index positions, a plurality of power-multiplying levers, each including a short arm carrying one line of the contacts and also including a long arm to which force may be applied to rock the lever, operating mechanism, and means operated thereby for concurrently applying force to said long arms of all said levers so as to concurrently rock all the levers in directions to bring the contacts carried on their short arms into sensing coaction with the record material so as to sense all said index positions thereof simultaneously.

10. A data transmitting unit including a pocket to receive insertable record material having data designating perforations in index positions chosen from rows of such positions, means to search the record material for perforations and including rows of flexible contact brushes, one row for each row of index positions, rockable carriers, each for carrying the brushes of one row, manual operating mechanism, and means operated thereby for rocking all the carriers concurrently in a direction to engage the brushes with the record material to sense all the index positions of the record material for perforations, and said brushes being inclined relative to the plane of the record material so as to flex upon engagement with the record material, whereby the brushes may engage the record material with sufficient pressure to insure positive sensing coaction therewith without injury to either the brushes or to the record material.

11. The data transmitting unit as defined in claim 10, the inclination of the brushes being in the direction reverse to the direction of insertion of the record material and in the same direction as the direction of removal of the record material, whereby the record material may be removed while the brushes are engaged therewith.

12. A transmitting unit or the like comprising a pocket to receive insertable record material bearing data designating perforations in positions chosen from index positions arranged in columns and rows, sensing means for the record material including contact bars at one side of the pocket, one bar for each column of index positions, said sensing means including rows of flexible sensing brushes, one row for each row of index positions, rockable carriers, one for each row of brushes, said carriers being in the form of levers, each with one arm carrying the brushes of a row and with another arm swiveled to an actuating device common to all the brush carriers, an operating handle, a shaft turned thereby, and cam means on the shaft for moving the actuating device to cause all the brush carriers to rock in a direction in which the brushes of

each row move towards the record material to engage through the perforations therein with said contact bars.

13. A data transmitting unit or the like comprising means to support record material having columns of index positions selectively perforated to designate data, sensing means for the record material including pairs of upper and lower contact bars, one pair for each of chosen columns of the index positions, each bar of a pair spanning a different set of index positions, said bars being disposed at one side of the record material, sensing elements at the opposite side of the record material to engage through the perforations with the contact bars for partially closing sensing circuits, common return brushes to engage said bars for further closing the sensing circuits, means for shiftably supporting the common return brushes to be movable into engagement with either the upper or lower contact bars, and means for shifting the common return brushes into engagement with the upper contact bars and into alternative engagement with the lower contact bars whereby the sensing circuits through perforations in one set of index positions may be further closed after the sensing circuits through perforations in the other set of index positions have been so closed.

14. A data transmitting and reproducing system in which a transmitter unit electrically controls a remote reproducer unit, said reproducer unit being cyclically operable and having means whereby it may be made to perform successive cycles automatically and continuously, one after another, said transmitter unit including means to select data to be reproduced, removable electrical connections between the transmitter unit and the reproducer unit and circuits controlled by the transmitter unit according to the data selected thereby for controlling the reproducer to reproduce said data during a cycle of the reproducer, relay means controlled by the transmitter unit through said connections for preventing the reproducer from performing successive cycles under control of the first mentioned means, and further relay means controlled by the transmitter through said connections for initiating a cycle of the reproducer.

15. A transmitting and reproducing system comprising a transmitter unit having a pocket to receive and support freely manually insertable record material, said material having columns and rows of designation positions, marked in chosen positions to represent desired data, said transmitter unit also including devices concurrently to sense all said rows and columns of positions of the inserted record material for data representing markings, a reproducer unit including means to record the data represented by said markings, circuits controlled by the sensing devices to control the recording means to record the sensed data, checking means controlled by said circuits for detecting an error in the inserted record material, and means controlled by the checking means for manifesting the presence of a detected error.

16. The system as defined in claim 15, said transmitter unit further including a manual operating means actuated for bringing the sensing devices into sensing coaction with the inserted record material and means for mechanically retaining the operating means in actuated position, said manifesting means including means to prevent release of the retaining means, whereby the manual operating means is prevented from being re-actuated.

17. In combination, a card pocket to receive and simultaneously support a plurality of perforated record cards or an unperforated control card in place of one said perforated card, said perforated cards having columns of data designating perforations with each column spanning a predetermined column position within the pocket when the perforated cards are in the pocket and with the unperforated control card, when in the pocket, spanning those column positions otherwise spanned by the perforated card in place of which the control card has been inserted, sensing devices to sense the inserted cards for perforations, recording means controlled by the sensing devices to record the data designated by sensed perforations, means under control of the sensing means to detect blank columns, means controlled by said detecting means for manifesting a blank column detection, and means controlled by the control card, when in the pocket, for disabling the detecting means with respect to those column positions being spanned by the control card.

18. A transmitting and recording system comprising a transmitter unit including means to select data of a transaction to be reproduced, manually operated means in the transmitter for enabling the selected data of a transaction to be transmitted, means mechanically retaining the manually operated means in operated position, a reproducer to reproduce the data, circuits controlled by the data selecting means of the transmitter for transmitting the data to the reproducer and controlling the reproduction thereby of the data, means normally effective, when reproduction of the data of the transaction has been completed, for releasing the retaining means from the manually operated means to enable its restoration, means controlled by the circuits for checking the selected data for certain possible errors, and means controlled by the checking means when the presence of such error is detected for disabling the releasing means, whereby the manually operated means remains in operated position.

19. A transmitting and recording system comprising a transmitter including means to receive insertable record material bearing data pertaining to a transaction, means to sense the inserted record material for the record data, a cyclically operable reproducer including means to record the data of each transaction on one record card and including record handling means and record offsetting means, circuits controlled by the sensing means to transmit the record data and control the recording means to record the data on a record card during a cycle of the reproducer, means controlled by the transmitter, for each transaction to be transmitted, to initiate a cycle of the reproducer, means controlled by said circuits for checking the inserted record for a possible error, and means controlled by the checking means, when such error is detected, for operating the offsetting means to offset a record card.

20. A transmitting and recording system comprising a transmitter with means to sense record material for data to be transmitted, a reproducer with means to record the data upon a record card, circuits controlled by the sensing means to transmit the sensed data and control the recording means to record the sensed data upon a record card, means also controlled by the cir-

cuits for checking the transmitted data to detect a possible error, and marking means in the reproducer controlled by the checking means when an error is detected for marking the record card with an error indication.

21. A transmitter and recorder system comprising a transmitter with means to read out data to be transmitted, manual operating means for causing the read out means to operate to read out data, a reproducer with means to record the data, circuits controlled by the read out means to transmit the data and control the recording means to record the data, said circuits including removable operative electrical connections between the transmitter and the reproducer, electromechanical means in the transmitter for preventing operation of the manual operating means, and a circuit controlled by the reproducer when said connections are properly made for disabling the electromechanical means so as to enable the said manual operating means to be operated.

22. A transmitter and recorder system comprising a transmitter with means to read out data and manual operating means to cause the read out means to operate to read out data, a reproducer including record feeding means and recording means to which the record feeding means feeds a record to be recorded on with the said data, circuits controlled by the read out means to control the recording means to record the data, electrically controlled means to prevent operation of said manually operated means of the transmitter, and means in the reproducer for causing said electrically controlled means to be disabled when a record has been fed into proper position relative to the recording means in readiness to be recorded on with the data.

23. A transmitting and recording system comprising a transmitter with means to read out data of a transaction to be transmitted, a reproducer to reproduce said data, upon a record card, circuits to transmit the data, read out by the transmitter means, to the reproducer, a manipulative cancellation device at the transmitter to cancel the transaction, means in the reproducer for marking the record upon which the transaction has been recorded, and electrical means controlled by said cancellation device for causing operation of the marking means.

24. A transmitting and recording system comprising a transmitter unit to receive insertable record material bearing data pertaining to one kind of transaction or another, means to sense the record material for data so as to set up the data to be transmitted, a reproducer unit including means to record the data of each transaction upon one record card, circuits controlled by the sensing means to control the recording means to record the data, means to feed record cards, one after another, to the recording means, certain of said record cards being intended to receive data of only one said kind of transaction, means to detect arrival of such record card at the recording means, and means controlled by said detecting means when another kind of transaction has been set up in the transmitter for preventing the recording of the data of the latter transaction upon the latter record card.

25. A system as defined in claim 24, said means controlled by the detecting means, also causing the record feeding means to feed the said latter record card past the recording means and to feed a record card, suitable for the kind of transaction set up in the transmitter, to the recording means.

26. A transmitting and recording system comprising a transmitter unit with means to read out data pertaining to one kind of transaction or another and including kind-of-transaction differentiating means operable to differentiate one said kind of transaction from another, a reproducer with means to record the data pertaining to one kind of transaction upon a certain field of a record card and data pertaining to another kind of transaction upon a different field of a record card, circuits controlled by the read out means to control the recording means to record the data, means to feed the record cards, one after another to the recording means, any of which record cards may be a re-run card upon which data of one kind of transaction have already been recorded upon, means to detect the arrival of such record card at the recording means, and means controlled by said kind-of-transaction differentiating means and by said detecting means for by-passing said re-run card.

27. A system as defined in claim 24, and means controlled by the last-named controlled means for causing the feeding of the record cards to continue until a record card suitable to receive the record of the kind of transaction to be transmitted has been fed to the recording means.

28. A system as defined in claim 24, and means controlled by the last named controlled means for marking the by-passed record card to distinguish it from record cards on which current transactions of the same kind have been recorded.

29. A transmitting and recording system comprising a transmitter with means to set up data of successive transactions, one transaction at a time, a reproducer including recording means and record handling means to feed one record after another to the recording means, circuits for transmitting the data of each transaction set up on the transmitter to the reproducer to cause the recording means to record the data of each transaction upon one record, pre-set means to preselect predetermined data to be recorded upon each record to supplement the data of a transaction recorded thereon, and a circuit controlled by said pre-set means to control the recording means to record said predetermined data upon each record on which a transaction also is recorded; means in the transmitter operable when recording of the predetermined data is to be suppressed, and a relay controlled by the latter means to open the last-mentioned circuit so as to prevent the preset means from controlling the recording means, whereby recording of the predetermined data is suppressed.

30. A transmitting and recording system comprising a transmitter with means to set up data of successive transactions, one transaction at a time, a reproducer with recording means and record handling means to feed one record after another to the recording means, circuits to transmit the data of each transaction to the reproducer to control the recording means to record each such transaction upon a separate record fed to the recording means, pre-set means to preselect certain predetermined data which may be recorded upon each record to supplement the data of the transaction recorded thereon and to preselect other predetermined, supplementary data which may be alternatively recorded upon each such record, circuits controlled by the pre-set means to cause the recording means to record

said certain predetermined data or said other predetermined data, and means controlled by the transmitter for determining which of the predetermined data is to be recorded to supplement the data of the transaction set up in the transmitter.

31. In apparatus such as described, means to perforate index positions of card columns to represent data recording to the positions within the columns and to perforate like index positions to represent different data according to the location of the columns in which the perforations are made, data selecting means to select the first mentioned data, means controlled thereby for controlling the perforating means to selectively perforate different index positions of the columns to represent the latter data, other data selecting means to select said different data and the column or columns in which the perforations to represent the latter data are to be made, and means controlled by the latter data selecting means for perforating the selected column or columns to represent the said different data in accordance with the column location.

32. Apparatus such as described and including ing means to receive record material, sensing devices to sense the record material for data, manual means operable to cause the sensing devices to coact with the record material, means to latch the manual means in operated position, a keyboard having keys operable to select supplemental data and means to latch operated keys in their operated, data selecting positions, recording means controlled by the sensing devices and by the keys for recording the sensed data and the supplemental data, and means for concurrently releasing the operated keys and the manual means upon completion of the recording operation.

33. Apparatus such as defined in claim 32, selective settable interponent means between the releasing means and the key latching means settable in one position for enabling the releasing means to release the keys and in an alternative position in which the releasing means is ineffective to release the keys.

34. A transmitting and reproducing system for transmitting and recording library transactions or the like, comprising a transmitter unit including a pocket to insertably receive a book card and a borrower card, each card bearing perforations designating desired data, sensing devices to sense the inserted cards for perforations, manually operated actuating means for bringing the sensing devices into sensing coaction with the inserted cards, a cyclically operable reproducer unit including perforating means to perforate record cards, each with data pertaining to one library transaction, circuits controlled by the sensing devices to control the perforating means to perforate a card with the data sensed on the inserted book and borrower cards, means controlled by said actuating means for initiating a cycle of the reproducer during which the perforating means perforates a record card with the data sensed on the inserted book and borrower cards, preset means to preselect data information to be designated on the card in addition to the data derived from the book and borrower cards, and means controlled by the preset means for controlling the perforating means to perforate the card in accordance with the preselected data information during the cycle of the reproducer in which the data derived from the inserted book and borrower cards are perforated on the card.

35. A transmitting and reproducing system to transmit and reproduced loan and return library transactions, comprising a transmitter unit with a pocket to receive insertable book and borrower cards when a loan transaction is to be performed and to receive a book card and a return check when a return transaction is to be performed, means to sense the inserted card or cards for data, circuits controlled by the sensing means to transmit the sensed data, a reproducing unit including perforating means controlled by the circuits to perforate a record card in a loan field or a return field with designations of the transmitted data, and means controlled by the return check when inserted for causing the transmitted data to be perforated in the return field.

36. Apparatus comprising means to select data pertaining to one or another kind of transaction, means to record data of a transaction upon a record card, mechanism to feed record cards, certain of which are assigned to only one said kind of transaction, one after another to the recording means, means to detect the presence of a said certain record card at the recording means, means to detect the kind of transaction for which data has been selected, circuits controlled by the selecting means to control the recording means to record the selected data of a transaction upon a record card fed thereto, and means controlled jointly by said detecting means for preventing said circuits from being effective to cause recording upon a said certain record card unless data has been selected for the kind of transaction to which said certain record cards are assigned.

37. Apparatus comprising a transmitter unit and a recorder unit, said transmitter unit including information selecting means, operating means to cause selected information to be transmitted to the recorder unit to be recorded thereby, a handle to actuate the operating means, latching means to retain the operating means in actuated position, a device momentarily active under control of the recorder unit, after the selected information has been recorded, for releasing the latching means to enable the operating means to return to initial position, and means to prevent relatching of the operating means after action of said device has ceased and while the handle is maintained in operated position and, thereby, is maintaining the operating means in actuated position.

38. Apparatus comprising means to select data of one class or another class to be recorded, means to record the data upon a record card or the like, mechanism to feed record cards one after another to the recording means, certain of said record cards being assigned to only one said class of data, means to detect the presence of a said certain record card at the recording means, means to detect the class of data selected to be recorded, means controlled by the data selecting means to control the recording means to record the selected data upon a record card fed thereto, and means controlled jointly by both said detecting means for preventing said recording means from being effective to record selected data upon a said certain record card unless data has been selected of the class to which said certain record cards are assigned.

39. Apparatus such as defined in claim 38, means for normally interrupting operation of the

feeding mechanism when the recording of selected data on a record card by said recording means has been completed, said interrupting means being ineffective when the recording means is prevented from recording selected data upon a said certain record fed to the recording means, whereby the feeding mechanism will continue to feed record cards until one appropriate to the class of selected data has been fed to the recording means and the selected data has been recorded thereon.

40. Apparatus comprising recording means, mechanism to feed record-receiving elements; one after another, to recording position, certain of said elements being distinguished from others by a control designation, means for sensing the elements for the presence of a control designation, means to select data of one class or another to be recorded on said elements, means controlled by the selecting means to operate the recording means to record the selected data upon the element fed to recording position, and means, under control of said sensing means, and effective in consequence of the sensing of said control designation on a said element fed to the recording position, for preventing the recording means from operating to record selected data of one of said classes upon the latter element.

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CERTIFICATE OF CORRECTION.

Patent No. 2,355,389. August 8, 1944.

ALBERT W. MILLS, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 27, first column, line 26, claim 32, before "means" strike out "ing"; lines 69 and 74 respectively, claim 34, for "data" read --date--; and second column, line 4, claim 35, for "reproduced" read --reproduce--; 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 7th day of November, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.